

This document gives pertinent information concerning the reissuance of the VPDES Permit listed below. This permit is being processed as a Minor, Municipal permit. The discharge results from the operation of a 0.015 MGD wastewater treatment plant. This permit action consists of updating the proposed effluent limits to reflect the current Virginia WQS (effective January 6, 2011) and updating permit language as appropriate. The effluent limitations and special conditions contained in this permit will maintain the Water Quality Standards of 9VAC25-260 et seq.

1. Facility Name and Mailing Address: Boston Water & Sewer STP
2301 Wyoming Ave, NW
Washington, DC 20008
SIC Code : 4952 WWTP
Facility Location: 1 mile SSW of the intersection of
State Routes 522 and 707
County: Culpeper
Facility Contact Name: Don Hearl
Telephone Number: (540)825-6660
Facility E-mail Address: DonH@ess-services.com
2. Permit No.: VA0065358
Expiration Date of previous permit: December 15, 2013
Other VPDES Permits associated with this facility: VA0088749 – New, un-built facility
Other Permits associated with this facility: 3014724 Petroleum
E2/E3/E4 Status: Not Applicable
3. Owner Name: Boston Water & Sewer
Owner Contact/Title: Edward O'Brien, President
Telephone Number: (202)234-1567
Owner E-mail Address: eobrien@wyoave.net
4. Application Complete Date: July 3, 2013
Permit Drafted By: Alison Thompson
Date Drafted: January 14, 2014
Draft Permit Reviewed By: Joan Crowther
Date Reviewed: January 15, 2014
WPM Review By: Bryant Thomas
Date Reviewed: January 29, 2014
Public Comment Period : Start Date: February 25, 2014
End Date: March 27, 2014
5. Receiving Waters Information: See Attachment 1 for the Flow Frequency Determination
Receiving Stream Name : Hazel River, UT*
Stream Code: 3-XDH
Drainage Area at Outfall: <5 sq.mi.
River Mile: 0.03
Stream Basin: Rappahannock
Subbasin: None
Section: 4
Stream Class: III
Special Standards: None
Waterbody ID: VAN-E04R
7Q10 Low Flow: 0.0 MGD
7Q10 High Flow: 0.0 MGD
1Q10 Low Flow: 0.0 MGD
1Q10 High Flow: 0.0 MGD
30Q10 Low Flow: 0.0 MGD
30Q10 High Flow: 0.0 MGD
Harmonic Mean Flow: 0.0 MGD
30Q5 Flow: 0.0 MGD

*Unnamed Tributary

6. Statutory or Regulatory Basis for Special Conditions and Effluent Limitations:

☒ State Water Control Law
☒ Clean Water Act
☒ VPDES Permit Regulation
☒ EPA NPDES Regulation

____ EPA Guidelines
☒ Water Quality Standards
____ Other

7. Licensed Operator Requirements: Class IV

8. Reliability Class: Class II

9. Permit Characterization:

<input checked="" type="checkbox"/> Private	____ Effluent Limited	____ Possible Interstate Effect
____ Federal	<input checked="" type="checkbox"/> Water Quality Limited	____ Compliance Schedule Required
____ State	<input checked="" type="checkbox"/> Whole Effluent Toxicity Program Required	____ Interim Limits in Permit
____ POTW	____ Pretreatment Program Required	____ Interim Limits in Other Document
<input checked="" type="checkbox"/> TMDL	____ e-DMR Participant	

10. Wastewater Sources and Treatment Description:

This 0.015 MGD STP is a package unit using extended aeration activated sludge processes, clarification, disinfection, and discharge through Outfall 001 to an Unnamed Tributary (UT) of the Hazel River. There is an aerated flow equalization tank preceding the bar screen. The package plant has one aeration basin with diffusers, one ringlace tank, secondary clarification, and an aerobic sludge holding tank. The ringlace unit went online in August 1999 to enhance nitrification. Soda ash is added to the aeration basin for pH and alkalinity adjustment. Effluent from the secondary clarifier is disinfected using ultraviolet (UV) radiation. The UV system went online in August 2005. Cascade steps are used for post aeration.

See Attachment 2 for a facility schematic/diagram.

TABLE 1 – Outfall Description

Outfall Number	Discharge Sources	Treatment	Design Flow	Outfall Latitude and Longitude
001	Domestic and/or Commercial Wastewater	See Item 10 above.	0.015 MGD	38° 31' 31" N 78° 08' 14.3" W
See Attachment 3 for Woodville Quadrangle (197C) topographic map.				

11. Sludge Treatment and Disposal Methods:

The sludge is stored in an aerobic holding tank until it is pumped and hauled to the Remington WWTP (VA0076805) for additional treatment. Approximately 0.379 metric tons are generated in a one-year period.

12. Discharges, Intakes, Monitoring Stations, Other Items in Vicinity of Discharge

TABLE 2 – Other Items	
3-HAZ026.16	VADEQ Ambient Water Quality Monitoring Station upstream at the Route 522 Bridge in Culpeper County.
3-HAZ029.30	VA0088749 Boston Water & Sewer WWTW is a proposed facility that will discharge to the Hazel River downstream of this facility. This new treatment works will eliminate the discharge from VA0065358 (See Section 21.1.).

The Hazel River does not serve as a known source for potable water withdrawals.

13. Material Storage:

TABLE 3 - Material Storage		
Materials Description	Volume Stored	Spill/Stormwater Prevention Measures
Soda Ash	1 – 45 pound bucket	Stored in the onsite shed.

14. Site Inspection:

Performed by DEQ Compliance staff on March 20, 2007 (Attachment 4).

15. Receiving Stream Water Quality and Water Quality Standards:**a. Ambient Water Quality Data**

This facility discharges to an unnamed tributary to the Hazel River, which has not been monitored or assessed. The nearest downstream ambient monitoring station is located on the Hazel River. Station 3-HAZ026.16 is located at the Rt. 522 Bridge crossing, approximately 2.1 miles downstream of Outfall 001. The following is the water quality summary for this segment of the Hazel River, as taken from the 2012 Integrated Report:

The following DEQ ambient monitoring station is located on the Hazel River: 3-HAZ026.16, at Route 522. *E. coli* monitoring finds a bacterial impairment, resulting in an impaired classification for the recreation use. The aquatic life use is considered fully supporting. Wildlife and fish consumption were not assessed.

b. 303(d) Listed Stream Segments and Total Maximum Daily Loads (TMDLs)**Table 4 - Information on Downstream 303(d) Impairments and TMDLs**

Waterbody Name	Impaired Use	Cause	Distance From Outfall	TMDL completed	WLA	Basis for WLA	TMDL Schedule
Impairment Information in the 2012 Integrated Report							
Hazel River	Recreation	<i>E. coli</i>	0.03 miles	Rappahannock River Watershed Bacteria 01/23/08	2.61E+10 cfu/yr <i>E. coli</i>	126 cfu/100ml <i>E. coli</i> --- 0.015 MGD	---

The Rappahannock River Basin Bacteria TMDL took into account that there are currently two permitted facilities associated with Boston Sewer and Water (VA0065358 and VA0088749). The first, VA0065358 is currently in operation and has a design flow of 0.015 MGD. The second, VA0088749, has not yet been built but has a design flow of 0.4500 MGD. When the second facility is built and operational, the first facility will go offline. In the TMDL, it was not practical to assign a wasteload allocation for both facilities since both will not be operating at the same time. The TMDL assigned a wasteload allocation to the second facility, VA0088749, since it has the larger design flow. The load for the new facility is sufficient to cover the current facility while it is in operation and provide for the operation of the new facility when it is built.

The downstream tidal Rappahannock River is listed with a PCB impairment. In support for the PCB TMDL that is scheduled for development by 2016 for the tidal Rappahannock River, this facility is a candidate for low-level PCB monitoring. Low-level PCB analysis uses EPA Method 1668, which is capable of detecting low-level concentrations for all 209 PCB congeners. Low-level PCB monitoring is not warranted for this facility, as this is a facility has a discharge of less than 0.1 MGD and serves a

residential community. This facility is not expected to be a source of or discharge PCBs. Based upon this information, this facility will not be requested to monitor for low-level PCBs.

The planning statement is found in Attachment 5.

c. Receiving Stream Water Quality Criteria

Part IX of 9VAC25-260(360-550) designates classes and special standards applicable to defined Virginia river basins and sections. The receiving stream, an Unnamed Tributary to Hazel River, is located within Section 4 of the Rappahannock River Basin, and classified as a Class III water.

At all times, Class III waters must achieve a dissolved oxygen (D.O.) of 4.0 mg/L or greater, a daily average D.O. of 5.0 mg/L or greater, a temperature that does not exceed 32°C, and maintain a pH of 6.0-9.0 standard units (S.U.).

The Freshwater Water Quality/Wasteload Allocation Analysis (Attachment 6) details other water quality criteria applicable to the receiving stream.

Some Water Quality Criteria are dependent on the temperature and pH and Total Hardness of the stream and final effluent. The stream and final effluent values used as part of Attachment 6 are as follows:

pH and Temperature for Ammonia Criteria:

The freshwater, aquatic life Water Quality Criteria for Ammonia are dependent on the instream temperature and pH. Since the effluent may have an impact on the instream values, the temperature and pH values of the effluent must also be considered when determining the ammonia criteria for the receiving stream. The 90th percentile temperature and pH values are used because they best represent the critical design conditions of the receiving stream.

The 7Q10 and 1Q10 of the receiving stream are 0.0 MGD. In cases such as this, effluent pH and temperature data may be used to establish the ammonia water quality criteria. Staff has reviewed the available effluent data from the Discharge Monitoring Reports (December 2007-November 2013) for pH (there is no recent temperature data) and finds that the maximum pH value reported on the Discharge Monitoring Reports (DMRs) has decreased in recent years. The 90th percentile pH used for the last reissuance was 8.26 S.U. The 90th percentile value of the current maximum pH values is 7.7 S.U.; therefore, this lower value shall be used to establish the ammonia criteria for this reissuance. Since there is no recent temperature data, the previous 90th percentile pH value of 22.8°C shall be carried forward. The 90th percentile derivations are found as part of Attachment 6.

Total Hardness for Hardness-Dependent Metals Criteria:

The Water Quality Criteria for some metals are dependent on the receiving stream's total hardness (expressed as mg/L calcium carbonate) as well as the total hardness of the final effluent.

The 7Q10 of the receiving stream is zero and no ambient data is available, the effluent data for total hardness can be used to determine the hardness-dependent metals criteria. The hardness-dependent metals criteria in Attachment 6 are based on an effluent value of 83 mg/L which was provided in the 2008 permit application.

Bacteria Criteria:

The Virginia Water Quality Standards at 9VAC25-260-170A state that the following criteria shall apply to protect primary recreational uses in surface waters:

E. coli bacteria per 100 ml of water shall not exceed a monthly geometric mean of the following:

	Geometric Mean ¹
Freshwater <i>E. coli</i> (N/100 ml)	126

¹For a minimum of four weekly samples [taken during any calendar month].

d. Receiving Stream Special Standards

The State Water Control Board's Water Quality Standards, River Basin Section Tables (9VAC25-260-360, 370 and 380) designates the river basins, sections, classes, and special standards for surface waters of the Commonwealth of Virginia. The receiving stream, UT, Hazel River, is located within Section 4 of the Rappahannock Basin. This section has been designated with no special standards.

16. Antidegradation (9VAC25-260-30):

All state surface waters are provided one of three levels of antidegradation protection. For Tier 1 or existing use protection, existing uses of the water body and the water quality to protect these uses must be maintained. Tier 2 water bodies have water quality that is better than the water quality standards. Significant lowering of the water quality of Tier 2 waters is not allowed without an evaluation of the economic and social impacts. Tier 3 water bodies are exceptional waters and are so designated by regulatory amendment. The antidegradation policy prohibits new or expanded discharges into exceptional waters.

The receiving stream has been classified as Tier 1 based on an evaluation of receiving stream critical flows. The critical flows for the stream are zero and at times the stream flow is comprised of only effluent. It is staff's best professional judgment that such streams are Tier 1. Permit limits proposed have been established by determining wasteload allocations which will result in attaining and/or maintaining all water quality criteria which apply to the receiving stream, including narrative criteria. These wasteload allocations will provide for the protection and maintenance of all existing uses.

17. Effluent Screening, Wasteload Allocation, and Effluent Limitation Development:

To determine water quality-based effluent limitations for a discharge, the suitability of data must first be determined. Data is suitable for analysis if one or more representative data points is equal to or above the quantification level ("QL") and the data represent the exact pollutant being evaluated.

Next, the appropriate Water Quality Standards (WQS) are determined for the pollutants in the effluent. Then, the Wasteload Allocations (WLAs) are calculated. In this case since the critical flows 7Q10, 30Q10, and 1Q10 have been determined to be zero, the WLA's are equal to the WQS. The WLA values are then compared with available effluent data to determine the need for effluent limitations. Effluent limitations are needed if the 97th percentile of the daily effluent concentration values is greater than the acute wasteload allocation or if the 97th percentile of the four-day average effluent concentration values is greater than the chronic wasteload allocation. Effluent limitations are based on the most limiting WLA, the required sampling frequency, and statistical characteristics of the effluent data.

a. Effluent Screening:

Effluent data obtained from the permit application and DMRs has been reviewed and determined to be suitable for evaluation. Effluent data were reviewed. During the current permit term, the following parameters have had no limit exceedances reported on the DMRs: Ammonia as N, Dissolved Oxygen, and *E. coli*.

BOD exceeded the monthly average and weekly average in December 2010. TSS exceeded the monthly average in February 2010. Total Recoverable Zinc exceeded the monthly average in the second quarter of 2013. Total Recoverable Copper had monthly average exceedances in January 2008, July 2008, October 2008, August 2009, October 2009, February 2011, December 2011, and September 2013.

The facility has also had ongoing issues complying with the Whole Effluent Chronic Toxicity limitation of 1.44 TU-C. Monitoring is currently quarterly for Whole Effluent Toxicity (WET). Please see Fact Sheet Section 20.b for further discussion on the issues associated with WET testing.

The following pollutants require a wasteload allocation analysis: Ammonia as N, Total Recoverable Copper, and Total Recoverable Zinc.

b. Mixing Zones and Wasteload Allocations (WLAs):

Wasteload allocations (WLAs) are calculated for those parameters in the effluent with the reasonable potential to cause an exceedance of water quality criteria. The basic calculation for establishing a WLA is the steady state complete mix equation:

$$WLA = \frac{C_o [Q_e + (f)(Q_s)] - [(C_s)(f)(Q_s)]}{Q_e}$$

Where:	WLA	=	Wasteload allocation
	C _o	=	In-stream water quality criteria
	Q _e	=	Design flow
	Q _s	=	Critical receiving stream flow (1Q10 for acute aquatic life criteria; 7Q10 for chronic aquatic life criteria; 30Q10 for ammonia criteria; harmonic mean for carcinogen-human health criteria; and 30Q5 for non-carcinogen human health criteria)
	f	=	Decimal fraction of critical flow
	C _s	=	Mean background concentration of parameter in the receiving stream.

The water segment receiving the discharge via Outfall 001 is considered to have a 7Q10, 30Q10, and 1Q10 of 0.0 MGD. As such, there is no mixing zone and the WLA is equal to the C_o.

Staff derived wasteload allocations where parameters are reasonably expected to be present in an effluent (e.g., total residual chlorine where chlorine is used as a means of disinfection) and where effluent data indicate the pollutant is present in the discharge above quantifiable levels. With regard to the Outfall 001 discharge, ammonia as N is likely present since this is a WWTP treating sewage, and past Attachment A scans and current Discharge Monitoring Reports (DMRs) indicate that Total Recoverable Copper and Total Recoverable Zinc are present in the discharge. As such, Attachment 6 details the WLA derivations for these pollutants.

c. Effluent Limitations Toxic Pollutants, Outfall 001 –

9VAC25-31-220.D. requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Those parameters with WLAs that are near effluent concentrations are evaluated for limits.

The VPDES Permit Regulation at 9VAC25-31-230.D requires that monthly and weekly average limitations be imposed for continuous discharges from POTWs and monthly average and daily maximum limitations be imposed for all other continuous non-POTW discharges.

1) Ammonia as N:

Staff reevaluated pH and has concluded it is significantly different than what was used previously to derive ammonia criteria. As result, staff used the new data to determine new ammonia water quality criteria, new wasteload allocations (WLAs). DEQ guidance suggests using a sole data point of 9.0 mg/L for discharges containing domestic sewage to ensure the evaluation adequately addresses the potential for ammonia to be present in the discharge containing domestic sewage. The lower pH value would allow monthly average and weekly average Ammonia as N limitations of 4.2 mg/L (Attachment 7).

Although the new evaluation would allow relaxed Ammonia as N monthly average and weekly average limitations, the current Ammonia as N monthly average and weekly average limitations of 1.5 mg/L (documentation is found in Attachment 11) shall be carried forward for the following reasons:

- 1) Antibacksliding regulations prohibit relaxed effluent limitations unless specific criteria are met;
- 2) The facility was designed to meet a 1.5 mg/L monthly average and has been complying with the current limitations; and
- 3) The Environmental Protection Agency (EPA) finalized new, more stringent ammonia criteria in August 2013; possibly resulting in significant reductions in ammonia effluent in NPDES Discharge Permits. It is staff's best professional judgment that incorporation of these criteria into the Virginia Water Quality Standards is forthcoming. This and many other facilities may be required to comply with these new criteria during their next respective permit terms, so any increase in the Ammonia as N effluent limitations would be counterproductive to the new EPA ammonia criteria.

2) Metals:

Limits for copper and zinc were established during the 2003-2008 permit reissuance; the facility performed expanded effluent testing due to the Whole Effluent Toxicity issues noted in the effluent. During these scans, there were quantifiable effluent concentrations for Total Recoverable Copper and Total Recoverable Zinc. See Attachment 7 for the statistical derivation of the limits.

Since the facility has been meeting the Total Recoverable Zinc limitations except for one recent quarter, the monitoring shall continue to be quarterly. Total Recoverable Copper monitoring shall remain monthly since there have been numerous exceedances of the established limitations.

d. Effluent Limitations and Monitoring, Outfall 001 – Conventional and Non-Conventional Pollutants:

No changes to dissolved oxygen (D.O.), biochemical oxygen demand-5 day (BOD₅), total suspended solids (TSS) and pH limitations are proposed.

Dissolved Oxygen and BOD₅ limitations are based on the stream assimilation analysis conducted January 29, 1980 and are set to meet the water quality criteria for D.O. in the receiving stream (Attachment 8). It is staff's practice to equate the Total Suspended Solids limits with the BOD₅ limits. TSS limits are established to equal BOD₅ limits since the two pollutants are closely related in terms of treatment of domestic sewage.

Limits for chlorine were removed from the permit during the 2008 reissuance since the facility installed a UV system in August 2005.

pH limitations are set at the water quality criteria.

E. coli limitations are in accordance with the Water Quality Standards 9VAC25-260-170.

e. Effluent Limitations and Monitoring Summary:

The effluent limitations are presented in the following table. Limits were established for Flow, BOD₅, Total Suspended Solids, Ammonia as N, pH, Dissolved Oxygen, Whole Effluent Toxicity, Total Recoverable Copper, and Total Recoverable Zinc. The mass loading (kg/d) for monthly and weekly averages were calculated by multiplying the concentration values (mg/L), with the flow values (in MGD) and a conversion factor of 3.785.

Sample Type and Frequency are in accordance with the recommendations in the VPDES Permit Manual (2010) except for the Total Recoverable Zinc monitoring. During the last reissuance, Total Recoverable Zinc monitoring was reduced from monthly to quarterly; this shall continue with this reissuance since the facility has complied with the Zinc limitation.

The VPDES Permit Regulation at 9VAC25-31-30 and 40 CFR Part 133 require that the facility achieve at least 85% removal for BOD and TSS (or 65% for equivalent to secondary). The limits in this permit are water-quality-based effluent limits and result in greater than 85% removal.

18. Antibacksliding:

All limits in this permit are at least as stringent as those previously established. Backsliding does not apply to this reissuance.

19. Effluent Limitations/Monitoring Requirements:

Design flow is 0.015 MGD.

Effective Dates: During the period beginning with the permit's effective date and lasting until the expiration date.

PARAMETER	BASIS FOR LIMITS	DISCHARGE LIMITATIONS				MONITORING REQUIREMENTS	
		Monthly Average	Weekly Average	Minimum	Maximum	Frequency	Sample Type
Flow (MGD)	NA	NL	NA	NA	NL	1/D	Estimate
pH	3	NA	NA	6.0 S.U.	9.0 S.U.	1/D	Grab
BOD ₅	3,5	30 mg/L 1.7 kg/day	45 mg/L 2.6 kg/day	NA	NA	1/M	Grab
Total Suspended Solids (TSS)	2	30 mg/L 1.7 kg/day	45 mg/L 2.6 kg/day	NA	NA	1/M	Grab
Dissolved Oxygen	3,5	NA	NA	6.0 mg/L	NA	1/D	Grab
Ammonia, as N (mg/L)	3	1.5 mg/L	1.5 mg/L	NA	NA	1/M	Grab
<i>E. coli</i> (Geometric Mean)	3	126 n/100mls	NA	NA	NA	1/W	Grab
Total Recoverable Copper	3	18 ug/L	18 ug/L	NA	NA	1/M	Grab
Total Recoverable Zinc	3	130 ug/L	130 ug/L	NA	NA	1/3M	Grab
Chronic 3-brood Static Renewal (<i>Ceriodaphnia dubia</i>)	3	NA	NA	NA	1.44 TUc	1/3M	Grab
Chronic 7-day Static Renewal (<i>Pimephales promelas</i>)	3	NA	NA	NA	1.44 TUc	1/3M	Grab

The basis for the limitations codes are:

1. Federal Effluent Requirements
2. Best Professional Judgment
3. Water Quality Standards
4. DEQ Disinfection Guidance
5. Stream Model- Attachment 8

MGD = Million gallons per day.

NA = Not applicable.

NL = No limit; monitor and report.

S.U. = Standard units.

1/D = Once every day.

1/M = Once every month.

1/3M = Once every three months.

1/W = Once every week.

Estimate = Reported flow is to be based on the technical evaluation of the sources contributing to the discharge.

Grab = An individual sample collected over a period of time not to exceed 15-minutes.

20. Other Permit Requirements:

- a. Part I.B. of the permit contains quantification levels and compliance reporting instructions.

9VAC25-31-190.L.4.c. requires an arithmetic mean for measurement averaging and 9VAC25-31-220.D requires limits be imposed where a discharge has a reasonable potential to cause or contribute to an in-stream excursion of water quality criteria. Specific analytical methodologies for toxics are listed in this permit section as well as quantification levels (QLs) necessary to demonstrate compliance with applicable permit limitations or for use in future evaluations to determine if the pollutant has reasonable potential to cause or contribute to a violation. Required averaging methodologies are also specified.

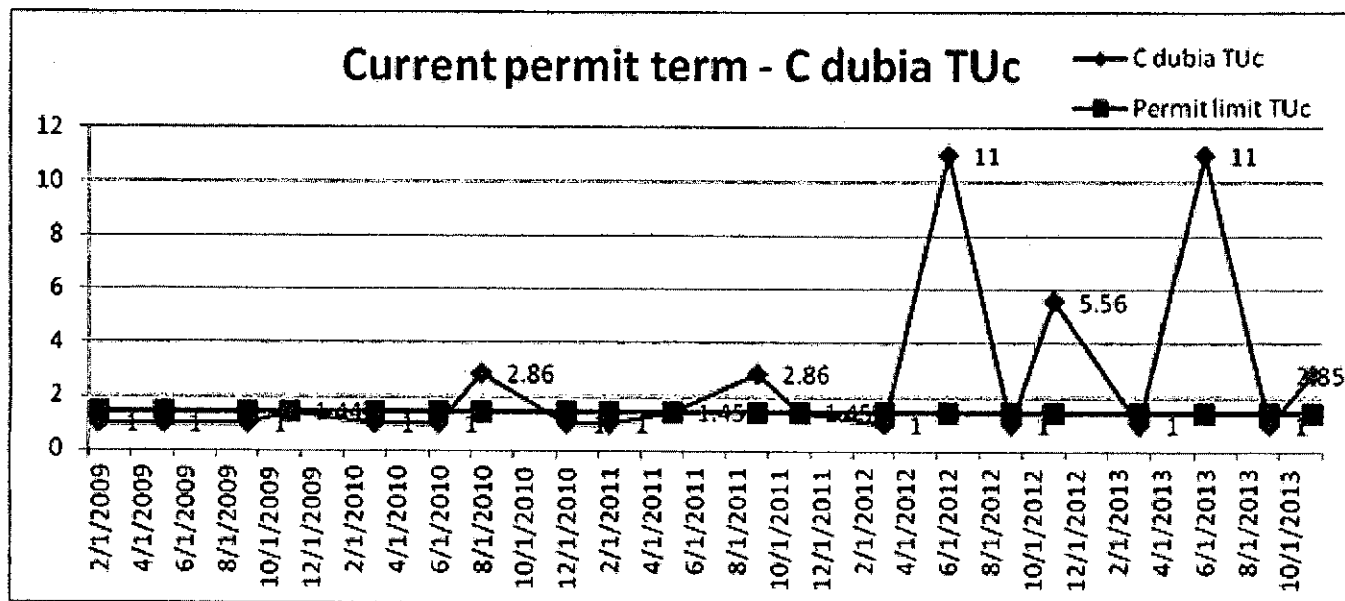
- b. Permit Section Part I.C., details the requirements for Whole Effluent Toxicity Program.

The VPDES Permit Regulation at 9VAC25-31-210 requires monitoring and 9VAC25-31-220.I, requires limitations in the permit to provide for and assure compliance with all applicable requirements of the State Water Control Law and the Clean Water Act. A WET Program is imposed for municipal facilities with a design rate >1.0 MGD, with an approved pretreatment program or required to develop a pretreatment program, or those determined by the Board based on effluent variability, compliance history, IWC, and receiving stream characteristics.

During a DEQ inspection in the late 1990s, DEQ staff noted an unusual chemical odor (an organic solvent was suspected) at the wastewater treatment plant (WWTP). Since there was a printing operation (Communication Corporation of America) that discharges to the WWTP, DEQ staff required the facility to conduct Whole Effluent Toxicity (WET) testing of the final effluent. Toxicity was noted and a Toxicity Reduction Evaluation (TRE) was conducted in 1999; nothing specific was identified as the toxic parameter, so the facility was given a WET limitation of 1.44 TU_c in 2003. Due to the small design flow

of the WWTP, the WET monitoring was established as quarterly.

The facility has had repeated exceedances of the limitation for the Chronic 3-brood Static Renewal test (*Ceriodaphnia dubia*) during the current permit term.



Attachment 9 contains a summary of past toxicity test results.

The facility has been issued Warning Letters for the recent exceedances of the WET limitation as well as for the exceedances of the Total Recoverable Copper limitation. The facility again exceeded the WET limitation in the fourth quarter of 2013, so the facility will issued a Notice of Violation in February 2014 and will also be referred to DEQ-Enforcement staff for potential enforcement action. The permit includes the Water Quality Criteria Reopener Special Condition (Fact Sheet Section 21.g) should there be a future need to modify the permit due to toxicity.

In the proposed draft permit, staff proposes to maintain the quarterly limitation of 1.44 TU_c with monitoring for two species, *Ceriodaphnia dubia* and *Pimephales promelas*. Any requirements for another TRE or other efforts to identify and eliminate the toxic parameter shall be handled through the appropriate enforcement action(s).

21. Other Special Conditions:

- a. **95% Capacity Reopener.** The VPDES Permit Regulation at 9VAC25-31-200.B.4 requires all POTWs and PVOTWs develop and submit a plan of action to DEQ when the monthly average influent flow to their sewage treatment plant reaches 95% or more of the design capacity authorized in the permit for each month of any three consecutive month period. The facility is a PVOTW.
- b. **Indirect Dischargers.** Required by VPDES Permit Regulation, 9VAC25-31-200 B.1 and B.2 for POTWs and PVOTWs that receive waste from someone other than the owner of the treatment works.
- c. **O&M Manual Requirement.** Required by Code of Virginia §62.1-44.19; Sewage Collection and Treatment Regulations, 9VAC25-790; VPDES Permit Regulation, 9VAC25-31-190.E. The permittee shall maintain a current Operations and Maintenance (O&M) Manual. The permittee shall operate the treatment works in accordance with the O&M Manual and shall make the O&M Manual available to Department personnel for review upon request. Any changes in the practices and procedures followed by the permittee shall be documented in the O&M Manual within 90 days of the effective date of the changes. Non-compliance with the O&M Manual shall be deemed a violation of the permit.
- d. **CTC, CTO Requirement.** The Code of Virginia § 62.1-44.19; Sewage Collection and Treatment Regulations, 9VAC25-790 requires that all treatment works treating wastewater obtain a Certificate to Construct prior to commencing construction and to obtain a Certificate to Operate prior to commencing operation of the treatment works.
- e. **Licensed Operator Requirement.** The Code of Virginia at §54.1-2300 et seq. and the VPDES Permit Regulation at 9VAC25-31-200 C, and by the Board for Waterworks and Wastewater Works Operators and Onsite Sewage System Professionals Regulations (18VAC160-20-10 et seq.) requires licensure of operators. This facility requires a Class IV

operator.

- f. **Reliability Class.** The Sewage Collection and Treatment Regulations at 9VAC25-790 require sewage treatment works to achieve a certain level of reliability in order to protect water quality and public health consequences in the event of component or system failure. Reliability means a measure of the ability of the treatment works to perform its designated function without failure or interruption of service. The facility is required to meet a reliability Class of II.
- g. **Water Quality Criteria Reopener.** The VPDES Permit Regulation at 9VAC25-31-220 D. requires establishment of effluent limitations to ensure attainment/maintenance of receiving stream water quality criteria. Should data collected and submitted for Attachment A of the permit, indicate the need for limits to ensure protection of water quality criteria, the permit may be modified or alternately revoked and reissued to impose such water quality-based limitations.
- h. **Sludge Reopener.** The VPDES Permit Regulation at 9VAC25-31-220.C requires all permits issued to treatment works treating domestic sewage (including sludge-only facilities) include a reopener clause allowing incorporation of any applicable standard for sewage sludge use or disposal promulgated under Section 405(d) of the CWA.
- i. **Sludge Use and Disposal.** The VPDES Permit Regulation at 9VAC25-31-100.P; 220.B.2, and 420 through 720, and 40 CFR Part 503 require all treatment works treating domestic sewage to submit information on their sludge use and disposal practices and to meet specified standards for sludge use and disposal. The facility includes a treatment works treating domestic sewage.
- j. **TMDL Reopener.** This special condition is to allow the permit to reopened if necessary to bring it in compliance with any applicable TMDL that may be developed and approved for the receiving stream.
- k. **Elimination of Discharge.** This special condition requires the permittee to eliminate the discharge from outfall 001 and submit a plan and schedule for closure of the existing wastewater treatment facility (VA0065358) within 30 days of the issuance of an CTO for the new Boston Water & Sewer wastewater treatment facility (VA0088749). The closure plan and schedule shall be submitted to DEQ for review and approval. The State Water Control Law §62.1-44.15:1.1, makes it illegal for an owner to cease operation and fail to implement a closure plan when failure to implement the plan would result in harm to human health or the environment. This condition is used to notify the owner of the need for a closure plan where a facility is being replaced or is expected to close.

22. Permit Section Part II.

Part II of the permit contains standard conditions that appear in all VPDES Permits. In general, these standard conditions address the responsibilities of the permittee, reporting requirements, testing procedures and records retention.

23. Changes to the Permit from the Previously Issued Permit:

- a. **Special Conditions:**
There are no changes proposed to the special conditions.
- b. **Monitoring and Effluent Limitations:**
There have been no changes to the effluent limitations or monitoring in the draft.
- c. **Other:**
 - 1) The streamcode was revised from XDH to 3-XDH. The stream mile was revised from 0.08 to 0.03 by DEQ-NRO Planning Staff.
 - 2) The latitude and longitude coordinates of the outfall were revised using updated GIS data.

23. Variances/Alternate Limits or Conditions:

There are no variances or alternate limits proposed.

25. Public Notice Information:

First Public Notice Date: February 25, 2014 Second Public Notice Date: March 4, 2014

Public Notice Information is required by 9VAC25-31-280 B. All pertinent information is on file and may be inspected, and

copied by contacting the: DEQ Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193, Telephone No. (703) 583-3834, Alison.Thompson@deq.virginia.gov. See Attachment 10 for a copy of the public notice document.

Persons may comment in writing or by email to the DEQ on the proposed permit action, and may request a public hearing, during the comment period. Comments shall include the name, address, and telephone number of the writer and of all persons represented by the commenter/requester, and shall contain a complete, concise statement of the factual basis for comments. Only those comments received within this period will be considered. The DEQ may decide to hold a public hearing, including another comment period, if public response is significant and there are substantial, disputed issues relevant to the permit. Requests for public hearings shall state 1) the reason why a hearing is requested; 2) a brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit; and 3) specific references, where possible, to terms and conditions of the permit with suggested revisions. Following the comment period, the Board will make a determination regarding the proposed permit action. This determination will become effective, unless the DEQ grants a public hearing. Due notice of any public hearing will be given. The public may request an electronic copy of the draft permit and fact sheet or review the draft permit and application at the DEQ Northern Regional Office by appointment.

26. Additional Comments:

Previous Board Action(s): There were no Consent Special Orders issued during the last permit term. The facility will be referred to Enforcement in February 2014 for effluent exceedances related to Total Recoverable Copper and Whole Effluent Toxicity.

Staff Comments: The reissuance of the permit was delayed as staff worked with the facility to try to resolve the WET issues prior to reissuing the permit. Since preliminary work done by the facility and their consultant have not located the source of the toxicity, staff elected to move forward with the permit reissuance.

Public Comment: The Virginia Department of Conservation and Recreation (DCR) requested coordination for this reissuance. Staff received DCR's comments on May 30, 2014. The natural resource associated with the site is the Appalachian jewelwing (a damselfly species). Their only recommendation was for the facility to use UV/ozone to replace chlorination disinfection and utilization of new technologies as they become available. The facility began using UV in 2005. If and when the facility is upgraded and/or expanded, the facility shall need to consider newer technologies for treatment of the wastewater.

Attachments to the Fact Sheet for Boston Water & Sewer STP (VA0065358)

Attachment 1	Flow Frequency Memorandum
Attachment 2	Facility Schematic
Attachment 3	Topographic Map
Attachment 4	Site Inspection
Attachment 5	Planning Statement
Attachment 6	Freshwater Water Quality Criteria/Wasteload Allocation Analysis 90 th Percentile Determinations for pH and Temperature
Attachment 7	Statistical Analyses for Ammonia, Copper and Zinc
Attachment 8	Dissolved Oxygen Model
Attachment 9	Whole Effluent Toxicity Documentation
Attachment 10	Public Notice

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY - WATER DIVISION
Water Quality Assessments and Planning
629 E. Main Street P.O. Box 10009 Richmond, Virginia 23240

SUBJECT: Flow Frequency Determination
 American Security Council Foundation STP - VA#0065358

TO: James Olson, NRO

FROM: Paul E. Herman, P.E., WQAP

DATE: February 3, 1998

COPIES: Ron Gregory, Charles Martin, File

This memo supercedes my February 9, 1993 memo to Jennie Dollard concerning the subject VPDES permit.

The American Security Council Foundation STP discharges to an unnamed tributary to the Hazel River near Slate Mills, VA. Stream flow frequencies are required at this site for use by the permit writer in developing effluent limitations for the VPDES permit.

At the discharge point, the receiving stream is depicted as a dry ravine on the USGS Woodville Quadrangle topographic map.
▶ The flow frequencies for dry ravines are 0.0 cfs for the 1Q10, 7Q10, 30Q5, high flow 1Q10, high flow 7Q10, and harmonic mean. For modeling purposes, flow frequencies have been determined for the Hazel River at a point just upstream of the dry ravine.

The VDEQ operated a continuous record gage on the Hazel River at Rixeyville Mills, VA (#01663500) from 1942 to 1993. The gage was located at the Route 229 bridge in Culpeper County, VA. The flow frequencies for the gage and the point on the Hazel River above the dry ravine are presented below. The values above the dry ravine were determined by drainage area proportions and do not address any withdrawals, discharges, or springs lying upstream.

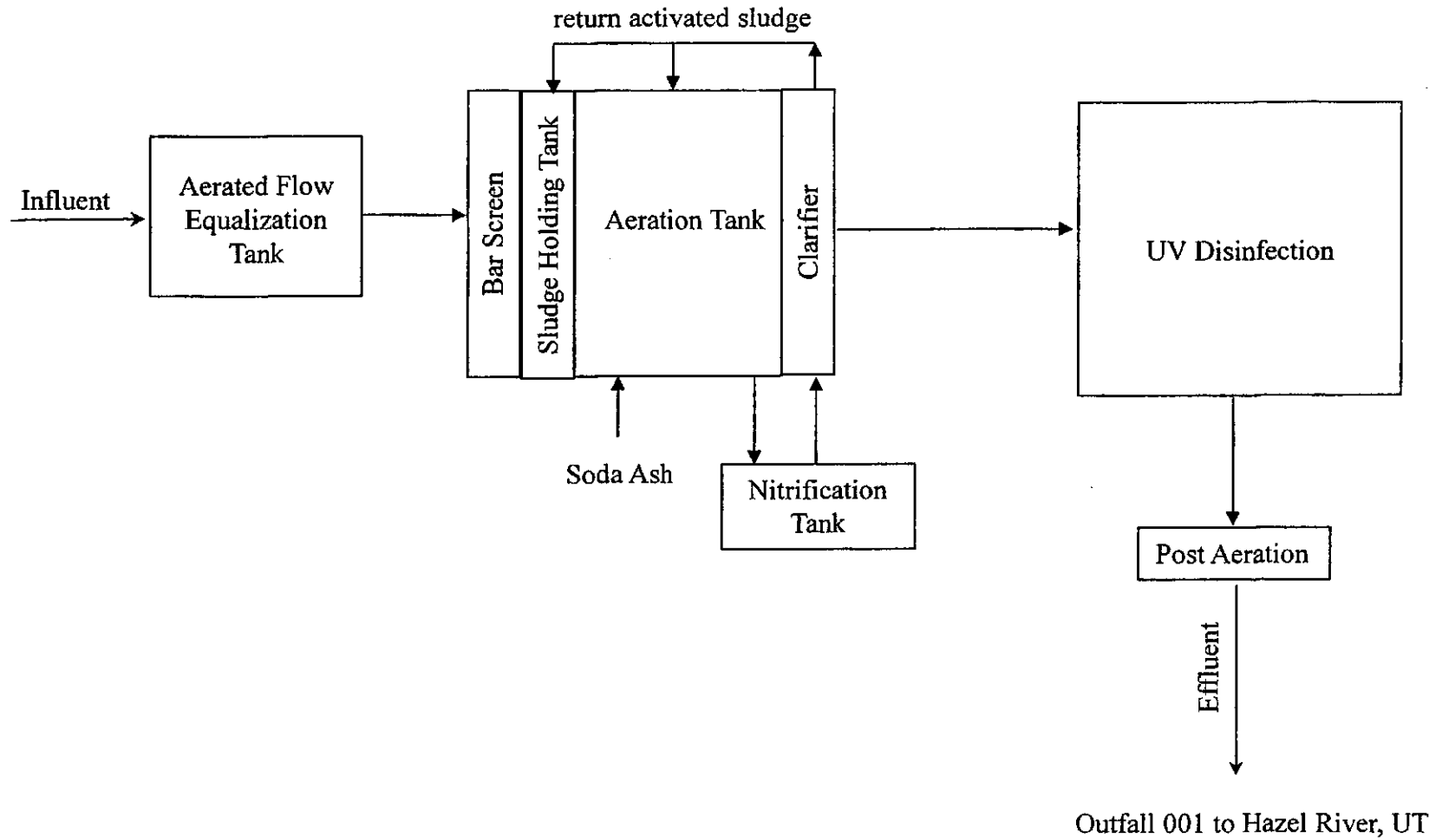
Hazel River at Rixeyville, VA (#01663500):

Drainage Area = 287 mi ²	
1Q10 = 3.8 cfs	High Flow 1Q10 = 64 cfs
7Q10 = 5.7 cfs	High Flow 7Q10 = 74 cfs
30Q5 = 19 cfs	HM = 86 cfs

Hazel River above dry ravine:

Drainage Area = 59.1 mi ²	
1Q10 = 0.78 cfs	High Flow 1Q10 = 13 cfs
7Q10 = 1.2 cfs	High Flow 7Q10 = 15 cfs
30Q5 = 3.9 cfs	HM = 18 cfs

The high flow months are January through May. If you have any questions concerning this analysis, please let me know.

Flow Diagram of Boston Water and Sewer STP



Thompson

COMMONWEALTH of VIRGINIA

DEPARTMENT OF ENVIRONMENTAL QUALITY

L. Preston Bryant, Jr.
Secretary of Natural Resources

NORTHERN VIRGINIA REGIONAL OFFICE
13901 Crown Court, Woodbridge, Virginia 22193
(703) 583-3800 Fax (703) 583-3801
www.deq.virginia.gov

David K. Paylor
Director

Jeffery A. Steers
Regional Director

April 16, 2007

Mr. Jack Luther
Onsite Manager
Boston Water & Sewer Company
P.O. Box 123
Boston, VA 22713

Re: Boston Water & Sewer STP, Permit VA0065358

Dear Mr. Luther:

Enclosed are copies of the technical and laboratory inspection reports generated from observations made while performing a Facility Technical Inspection and a Facility Laboratory Inspection at the Boston Water & Sewer Company - Sewage Treatment Plant (STP) on March 20, 2007. The compliance/monitoring staff would like to thank your staff for their time and assistance during the inspection.

Summaries for both the technical and laboratory inspections are enclosed. The facility had **Deficiencies** for the laboratory inspection. Please note the requirements and recommendations addressed in the technical summary. Additional inspections may be conducted to confirm the facility is in compliance with permit requirements. Please submit in writing a progress report to this office by **May 16, 2007** for the items addressed in the summary.

If you have any questions or comments concerning this report, please feel free to contact me at the Northern Virginia Regional Office at (703) 583-3909 or by E-mail at wgharback@deq.virginia.gov.

Sincerely,

Wilamena Harback

Wilamena Harback
Environmental Specialist II

cc: Permits / DMR File
Compliance Manager
Compliance Auditor
Compliance Inspector
Steve Stell - OWCP
ESS - Culpeper, VA - Don Hearl

Attachment 4

**Summary of conditions from last inspection
(September 25, 2000)**

Problem identified	Corrected	Not Correct
1. Sediment laden rainwater was getting into the chlorine contact chamber.	[x]	[]
2. O & M needs updating for EQ Basin/Flow measurement.	[x]	[]

Summary of conditions for current inspection

Comments:

1. The Chlorine Contact Chamber has since been replaced with a UV unit by Trojan Systems. The Chlorine Contact Chamber is not longer there (dismantled) and the UV unit is operational (see UV Process Sheet). The facility has also updated their O & M Manual to reflect this change.
2. These updates were sent for the O & M Manual.

Recommendations for action:

1. The UV Intensity display was displaying 0.0 mW/cm². This display should be used by the operator to distinguish how well the disinfection process is functioning. This condition needs to be fixed.
2. The pH probe had precipitate inside the bulb. The solution that the pH probe is stored in contains growth all through the bottle and there was some on the probe casing. These conditions were and discussed with the operator.

**DEQ
WATER FACILITY INSPECTION REPORT
PREFACE**

VPDES/State Certification No.	(RE) Issuance Date	Amendment Date	Expiration Date
VA0065358	September 1, 2003		August 31, 2008
Facility Name		Address	
Boston Water & Sewer Company		5545 Security Circle, Boston, VA 22713	
Owner Name		Address	
American Security Council Foundation		5545 Security Circle, Boston, VA 22713	
Responsible Official		Title	
Mr. Jack Luther		Onsite Manager	
Responsible Operator		Operator Cert. Class/number	
(ESS) Troy C. Jenkins Jr.		Class III/ 1911-004709	

TYPE OF FACILITY:

DOMESTIC				INDUSTRIAL			
Federal		Major		Major		Primary	
Non-federal	X	Minor	X	Minor		Secondary	

INFLUENT CHARACTERISTICS:

DESIGN:

<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="height: 20px;">Flow</td></tr> <tr><td style="height: 20px;">Population Served</td></tr> <tr><td style="height: 20px;">Connections Served</td></tr> <tr><td style="height: 20px;">BOD₅</td></tr> <tr><td style="height: 20px;">TSS</td></tr> </table>	Flow	Population Served	Connections Served	BOD ₅	TSS	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr><td style="height: 20px;">0.015 MGD</td></tr> <tr><td style="height: 20px;">Varies</td></tr> <tr><td style="height: 20px;">2 Pump Stations</td></tr> <tr><td style="height: 20px;">Not tested</td></tr> <tr><td style="height: 20px;">Not tested</td></tr> </table>	0.015 MGD	Varies	2 Pump Stations	Not tested	Not tested
Flow											
Population Served											
Connections Served											
BOD ₅											
TSS											
0.015 MGD											
Varies											
2 Pump Stations											
Not tested											
Not tested											

EFFLUENT LIMITS: Units in mg/L unless otherwise specified.

Parameter	Min.	Avg.	Max.	Parameter	Min.	Avg.	Max.
Flow (MGD)	0.015		NL	DO	6.0		
pH (S.U.)	6.0		9.0				
TSS		45					
BOD₅		45					
Ammonia as Nitrogen		1.5					
TRC		0.010					
Receiving Stream				UT To Hazel Run			
Basin				Rappahannock River			
Discharge Point (LAT)				38° 31' 32" N			

**DEQ
WATER FACILITY
INSPECTION REPORT
PART 1**

Inspection date: **March 20, 2007** Date form completed: **April 16, 2007**
Inspection by: **Wilamena Harback** Inspection agency: **DEQ NVRO**
Time spent: **18 hours** Announced: **Yes**
Reviewed by: *Ed Stuart* 4/16/07 Scheduled: **Yes**
Present at inspection: **Ed Stuart (DEQ); Troy Jenkins Jr and Rebecca Johnsen**

TYPE OF FACILITY:**Domestic****Industrial**

☐ Federal ☐ Major ☐ Major ☐ Primary
☒ Nonfederal ☒ Minor ☐ Minor ☐ Secondary

TYPE OF INSPECTION:

☐ Routine
☒ Compliance/Assistance/Complaint
☐ Reinspection

Date of last inspection: **September 25, 2000**
Agency: **DEQ NVRO**

Population served: **Varies**Connections served: **2 Pump Stations**Last month average: (Effluent) Month/year: **February 2007**

Flow:	0.001	MGD	pH:	7.3	S.U.	TSS:	11.3	mg/L
OD ₅	5	mg/L	DO:	11.5	mg/L	Ammonia	<QL	mg/L

DATA VERIFIED IN PREFACE☒ Updated ☐ No changes

Has there been any new construction?

☐ Yes☒ No

If yes, were plans and specifications approved?

☐ Yes☐ No☐ NA

EQ approval date:

To: Alison Thompson
From: Jennifer Carlson

Date: 7/15/13

Subject: Planning Statement for Boston Water & Sewer STP

Permit Number: VA0065358

Information for Outfall 001:

Discharge Type: Municipal
Discharge Flow: 0.015 MGD
Receiving Stream: Hazel River, UT
Latitude / Longitude: 38°31'31" / -78°08'14"3
River mile: 0.03
Streamcode: 3-XDH
Waterbody: VAN-E04R
Water Quality Standards: Class III, Section 4
Drainage Area: <5 sq miles

1. Please provide water quality monitoring information for the receiving stream segment. If there is not monitoring information for the receiving stream segment, please provide information on the nearest downstream monitoring station, including how far downstream the monitoring station is from the outfall.

This facility discharges to an unnamed tributary to the Hazel River, which has not been monitored or assessed. The nearest downstream ambient monitoring station is located on the Hazel River. Station 3-HAZ026.16 is located at the Rt. 522 Bridge crossing, approximately 2.1 miles downstream of Outfall 001. The following is the water quality summary for this segment of the Hazel River, as taken from the Draft 2012 Integrated Report*:

The following are the DEQ ambient monitoring stations located on the Hazel River:

- 3-HAZ026.16, at Route 522

E. coli monitoring finds a bacterial impairment, resulting in an impaired classification for the recreation use. The aquatic life use is considered fully supporting. Wildlife and fish consumption were not assessed.

**Virginia's Draft 2012 Integrated Report (IR) has been through the public comment period and reviewed by EPA. The 2012 IR is currently awaiting final approval.*

2. Does this facility discharge to a stream segment on the 303(d) list? If yes, please fill out Table A.

No.

3. Are there any downstream 303(d) listed impairments that are relevant to this discharge? If yes, please fill out Table B.

Yes.

Table B. Information on Downstream 303(d) Impairments and TMDLs

Waterbody Name	Impaired Use	Cause	Distance From Outfall	TMDL completed	WLA	Basis for WLA	TMDL Schedule
Impairment Information in the Draft 2012 Integrated Report*							
Hazel River	Recreation	<i>E. coli</i>	0.03 miles	Rappahannock River Watershed Bacteria 01/23/08	2.61E+10 cfu/yr <i>E. coli</i>	126 cfu/100ml <i>E. coli</i> --- 0.015 MGD	---

**Virginia's Draft 2012 Integrated Report (IR) has been through the public comment period and reviewed by EPA. The 2012 IR is currently awaiting final approval.*

The Rappahannock River Basin Bacteria TMDL took into account that there are currently two permitted facilities associated with Boston Sewer and Water (VA0065358 and VA0088749). The first, VA0065358 is currently in operation and has a design flow of 0.0150 MGD. The second, VA0088749, has not yet been built but has a design flow of 0.4500 MGD. When the second facility is built and operational, the first facility will go offline. In the TMDL, it was not practical to assign a wasteload allocation for both facilities since both will not be operating at the same time. The TMDL assigned a wasteload allocation to the second facility, VA0088749, since it has the larger design flow. The load for the new facility is sufficient to cover the current facility while it is in operation and provide for the operation of the new facility when it is built.

4. Is there monitoring or other conditions that Planning/Assessment needs in the permit?

The downstream tidal Rappahannock River is listed with a PCB impairment. In support for the PCB TMDL that is scheduled for development by 2016 for the tidal Rappahannock River, this facility is a candidate for low-level PCB monitoring. Low-level PCB analysis uses EPA Method 1668, which is capable of detecting low-level concentrations for all 209 PCB congeners. Low-level PCB monitoring is not warranted for this facility, as this is a facility has a discharge of less than 0.1 MGD and serves a residential community. This facility is not expected to be a source of or discharge PCBs. Based upon this information, this facility will not be requested to monitor for low-level PCBs.

There is a completed downstream TMDL for the aquatic life use impairment for the Chesapeake Bay. However, the Bay TMDL and the WLAs contained within the TMDL are not addressed in this planning statement.

5. Fact Sheet Requirements – Please provide information regarding any drinking water intakes located within a 5 mile radius of the discharge point.

There are no public water supply intakes located within 5 miles of this discharge.

FRESHWATER WATER QUALITY CRITERIA / WASTELOAD ALLOCATION ANALYSIS

Facility Name: Boston Water & Sewer STP

Permit No.: VA0065358

Receiving Stream: Hazel River, UT

Version: OWP Guidance Memo 00-2011 (8/24/00)

Stream Information	Stream Flows	Mixing Information	Effluent Information
Mean Hardness (as CaCO3) = mg/L	1Q10 (Annual) = 0 MGD	Annual - 1Q10 Mix = 100 %	Mean Hardness (as CaCO3) = 83 mg/L
90% Temperature (Annual) = deg C	7Q10 (Annual) = 0 MGD	- 7Q10 Mix = 100 %	90% Temp (Annual) = 22.8 deg C
90% Temperature (Wet season) = deg C	30Q10 (Annual) = 0 MGD	- 30Q10 Mix = 100 %	90% Temp (Wet season) = deg C
90% Maximum pH = SU	1Q10 (Wet season) = 0 MGD	Wet Season - 1Q10 Mix = 100 %	90% Maximum pH = 7.7 SU
10% Maximum pH = SU	30Q10 (Wet season) = 0 MGD	- 30Q10 Mix = 100 %	10% Maximum pH = SU
Tier Designation (1 or 2) = 1	30Q5 = 0 MGD		Discharge Flow = 0.015 MGD
Public Water Supply (PWS) Y/N? = n	Harmonic Mean = 0 MGD		
Trout Present Y/N? = n			
Early Life Stages Present Y/N? = y			

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Acenaphthene	0	--	--	na	9.9E+02	--	--	na	9.9E+02	--	--	--	--	--	--	--	--	--	--	na	9.9E+02
Acrolein	0	--	--	na	9.3E+00	--	--	na	9.3E+00	--	--	--	--	--	--	--	--	--	--	na	9.3E+00
Acrylonitrile ^c	0	--	--	na	2.5E+00	--	--	na	2.5E+00	--	--	--	--	--	--	--	--	--	--	na	2.5E+00
Aldrin ^c	0	3.0E+00	--	na	5.0E-04	3.0E+00	--	na	5.0E-04	--	--	--	--	--	--	--	--	3.0E+00	--	na	5.0E-04
Ammonia-N (mg/l) (Yearly)	0	1.44E+01	2.10E+00	na	--	1.44E+01	2.10E+00	na	--	--	--	--	--	--	--	--	--	1.44E+01	2.10E+00	na	--
Ammonia-N (mg/l) (High Flow)	0	1.44E+01	3.58E+00	na	--	1.44E+01	3.58E+00	na	--	--	--	--	--	--	--	--	--	1.44E+01	3.58E+00	na	--
Anthracene	0	--	--	na	4.0E+04	--	--	na	4.0E+04	--	--	--	--	--	--	--	--	--	--	na	4.0E+04
Antimony	0	--	--	na	6.4E+02	--	--	na	6.4E+02	--	--	--	--	--	--	--	--	--	--	na	6.4E+02
Arsenic	0	3.4E+02	1.5E+02	na	--	3.4E+02	1.5E+02	na	--	--	--	--	--	--	--	--	--	3.4E+02	1.5E+02	na	--
Barium	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Benzene ^c	0	--	--	na	5.1E+02	--	--	na	5.1E+02	--	--	--	--	--	--	--	--	--	--	na	5.1E+02
Benzidine ^c	0	--	--	na	2.0E-03	--	--	na	2.0E-03	--	--	--	--	--	--	--	--	--	--	na	2.0E-03
Benzo (a) anthracene ^c	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	1.8E-01
Benzo (b) fluoranthene ^c	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	1.8E-01
Benzo (k) fluoranthene ^c	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	1.8E-01
Benzo (a) pyrene ^c	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	1.8E-01
Bis(2-Chloroethyl) Ether ^c	0	--	--	na	5.3E+00	--	--	na	5.3E+00	--	--	--	--	--	--	--	--	--	--	na	5.3E+00
Bis(2-Chloroisopropyl) Ether	0	--	--	na	6.5E+04	--	--	na	6.5E+04	--	--	--	--	--	--	--	--	--	--	na	6.5E+04
Bis 2-Ethylhexyl Phthalate ^c	0	--	--	na	2.2E+01	--	--	na	2.2E+01	--	--	--	--	--	--	--	--	--	--	na	2.2E+01
Bromoform ^c	0	--	--	na	1.4E+03	--	--	na	1.4E+03	--	--	--	--	--	--	--	--	--	--	na	1.4E+03
Butylbenzylphthalate	0	--	--	na	1.9E+03	--	--	na	1.9E+03	--	--	--	--	--	--	--	--	--	--	na	1.9E+03
Cadmium	0	3.2E+00	9.8E-01	na	--	3.2E+00	9.8E-01	na	--	--	--	--	--	--	--	--	--	3.2E+00	9.8E-01	na	--
Carbon Tetrachloride ^c	0	--	--	na	1.6E+01	--	--	na	1.6E+01	--	--	--	--	--	--	--	--	--	--	na	1.6E+01
Chlordane ^c	0	2.4E+00	4.3E-03	na	8.1E-03	2.4E+00	4.3E-03	na	8.1E-03	--	--	--	--	--	--	--	--	2.4E+00	4.3E-03	na	8.1E-03
Chloride	0	8.6E+05	2.3E+05	na	--	8.6E+05	2.3E+05	na	--	--	--	--	--	--	--	--	--	8.6E+05	2.3E+05	na	--
TRC	0	1.9E+01	1.1E+01	na	--	1.9E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	1.9E+01	1.1E+01	na	--
Chlorobenzene	0	--	--	na	1.6E+03	--	--	na	1.6E+03	--	--	--	--	--	--	--	--	--	--	na	1.6E+03

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Chlorodibromomethane ^c	0	--	--	na	1.3E+02	--	--	na	1.3E+02	--	--	--	--	--	--	--	--	--	--	na	1.3E+02
Chloroform	0	--	--	na	1.1E+04	--	--	na	1.1E+04	--	--	--	--	--	--	--	--	--	--	na	1.1E+04
2-Chloronaphthalene	0	--	--	na	1.6E+03	--	--	na	1.6E+03	--	--	--	--	--	--	--	--	--	--	na	1.6E+03
2-Chlorophenol	0	--	--	na	1.5E+02	--	--	na	1.5E+02	--	--	--	--	--	--	--	--	--	--	na	1.5E+02
Chlorpyrifos	0	8.3E-02	4.1E-02	na	--	8.3E-02	4.1E-02	na	--	--	--	--	--	--	--	--	--	8.3E-02	4.1E-02	na	--
Chromium III	0	4.9E+02	6.4E+01	na	--	4.9E+02	6.4E+01	na	--	--	--	--	--	--	--	--	--	4.9E+02	6.4E+01	na	--
Chromium VI	0	1.6E+01	1.1E+01	na	--	1.6E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	1.6E+01	1.1E+01	na	--
Chromium, Total	0	--	--	1.0E+02	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Chrysene ^c	0	--	--	na	1.8E-02	--	--	na	1.8E-02	--	--	--	--	--	--	--	--	--	--	na	1.8E-02
Copper	0	1.1E+01	7.6E+00	na	--	1.1E+01	7.6E+00	na	--	--	--	--	--	--	--	--	--	1.1E+01	7.6E+00	na	--
Cyanide, Free	0	2.2E+01	5.2E+00	na	1.6E+04	2.2E+01	5.2E+00	na	1.6E+04	--	--	--	--	--	--	--	--	2.2E+01	5.2E+00	na	1.6E+04
DDD ^c	0	--	--	na	3.1E-03	--	--	na	3.1E-03	--	--	--	--	--	--	--	--	--	--	na	3.1E-03
DDE ^c	0	--	--	na	2.2E-03	--	--	na	2.2E-03	--	--	--	--	--	--	--	--	--	--	na	2.2E-03
DDT ^c	0	1.1E+00	1.0E-03	na	2.2E-03	1.1E+00	1.0E-03	na	2.2E-03	--	--	--	--	--	--	--	--	1.1E+00	1.0E-03	na	2.2E-03
Demeton	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	--	1.0E-01	na	--
Diazinon	0	1.7E-01	1.7E-01	na	--	1.7E-01	1.7E-01	na	--	--	--	--	--	--	--	--	--	1.7E-01	1.7E-01	na	--
Dibenz(a,h)anthracene ^c	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	1.8E-01
1,2-Dichlorobenzene	0	--	--	na	1.3E+03	--	--	na	1.3E+03	--	--	--	--	--	--	--	--	--	--	na	1.3E+03
1,3-Dichlorobenzene	0	--	--	na	9.6E+02	--	--	na	9.6E+02	--	--	--	--	--	--	--	--	--	--	na	9.6E+02
1,4-Dichlorobenzene	0	--	--	na	1.9E+02	--	--	na	1.9E+02	--	--	--	--	--	--	--	--	--	--	na	1.9E+02
3,3-Dichlorobenzidine ^c	0	--	--	na	2.8E-01	--	--	na	2.8E-01	--	--	--	--	--	--	--	--	--	--	na	2.8E-01
Dichlorobromomethane ^c	0	--	--	na	1.7E+02	--	--	na	1.7E+02	--	--	--	--	--	--	--	--	--	--	na	1.7E+02
1,2-Dichloroethane ^c	0	--	--	na	3.7E+02	--	--	na	3.7E+02	--	--	--	--	--	--	--	--	--	--	na	3.7E+02
1,1-Dichloroethylene	0	--	--	na	7.1E+03	--	--	na	7.1E+03	--	--	--	--	--	--	--	--	--	--	na	7.1E+03
1,2-trans-dichloroethylene	0	--	--	na	1.0E+04	--	--	na	1.0E+04	--	--	--	--	--	--	--	--	--	--	na	1.0E+04
2,4-Dichlorophenol	0	--	--	na	2.9E+02	--	--	na	2.9E+02	--	--	--	--	--	--	--	--	--	--	na	2.9E+02
2,4-Dichlorophenoxy acetic acid (2,4-D)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1,2-Dichloropropane ^c	0	--	--	na	1.5E+02	--	--	na	1.5E+02	--	--	--	--	--	--	--	--	--	--	na	1.5E+02
1,3-Dichloropropene ^c	0	--	--	na	2.1E+02	--	--	na	2.1E+02	--	--	--	--	--	--	--	--	--	--	na	2.1E+02
Dieldrin ^c	0	2.4E-01	5.6E-02	na	5.4E-04	2.4E-01	5.6E-02	na	5.4E-04	--	--	--	--	--	--	--	--	2.4E-01	5.6E-02	na	5.4E-04
Diethyl Phthalate	0	--	--	na	4.4E+04	--	--	na	4.4E+04	--	--	--	--	--	--	--	--	--	--	na	4.4E+04
2,4-Dimethylphenol	0	--	--	na	8.5E+02	--	--	na	8.5E+02	--	--	--	--	--	--	--	--	--	--	na	8.5E+02
Dimethyl Phthalate	0	--	--	na	1.1E+06	--	--	na	1.1E+06	--	--	--	--	--	--	--	--	--	--	na	1.1E+06
Di-n-Butyl Phthalate	0	--	--	na	4.5E+03	--	--	na	4.5E+03	--	--	--	--	--	--	--	--	--	--	na	4.5E+03
2,4-Dinitrophenol	0	--	--	na	5.3E+03	--	--	na	5.3E+03	--	--	--	--	--	--	--	--	--	--	na	5.3E+03
2-Methyl-4,6-Dinitrophenol	0	--	--	na	2.8E+02	--	--	na	2.8E+02	--	--	--	--	--	--	--	--	--	--	na	2.8E+02
2,4-Dinitrotoluene ^c	0	--	--	na	3.4E+01	--	--	na	3.4E+01	--	--	--	--	--	--	--	--	--	--	na	3.4E+01
Dioxin 2,3,7,8- tetrachlorodibenzo-p-dioxin	0	--	--	na	5.1E-08	--	--	na	5.1E-08	--	--	--	--	--	--	--	--	--	--	na	5.1E-08
1,2-Diphenylhydrazine ^c	0	--	--	na	2.0E+00	--	--	na	2.0E+00	--	--	--	--	--	--	--	--	--	--	na	2.0E+00
Alpha-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.2E-01	5.6E-02	na	8.9E+01	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	na	8.9E+01
Beta-Endosulfan	0	2.2E-01	5.6E-02	na	8.9E+01	2.2E-01	5.6E-02	na	8.9E+01	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	na	8.9E+01
Alpha + Beta Endosulfan	0	2.2E-01	5.6E-02	--	--	2.2E-01	5.6E-02	--	--	--	--	--	--	--	--	--	--	2.2E-01	5.6E-02	--	--
Endosulfan Sulfate	0	--	--	na	8.9E+01	--	--	na	8.9E+01	--	--	--	--	--	--	--	--	--	--	na	8.9E+01
Endrin	0	8.6E-02	3.6E-02	na	6.0E-02	8.6E-02	3.6E-02	na	6.0E-02	--	--	--	--	--	--	--	--	8.6E-02	3.6E-02	na	6.0E-02
Endrin Aldehyde	0	--	--	na	3.0E-01	--	--	na	3.0E-01	--	--	--	--	--	--	--	--	--	--	na	3.0E-01

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Ethylbenzene	0	--	--	na	2.1E+03	--	--	na	2.1E+03	--	--	--	--	--	--	--	--	--	--	na	2.1E+03
Fluoranthene	0	--	--	na	1.4E+02	--	--	na	1.4E+02	--	--	--	--	--	--	--	--	--	--	na	1.4E+02
Fluorene	0	--	--	na	5.3E+03	--	--	na	5.3E+03	--	--	--	--	--	--	--	--	--	--	na	5.3E+03
Foaming Agents	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Gulthion	0	--	1.0E-02	na	--	--	1.0E-02	na	--	--	--	--	--	--	--	--	--	--	1.0E-02	na	--
Heptachlor ^c	0	5.2E-01	3.8E-03	na	7.9E-04	5.2E-01	3.8E-03	na	7.9E-04	--	--	--	--	--	--	--	--	5.2E-01	3.8E-03	na	7.9E-04
Heptachlor Epoxide ^c	0	5.2E-01	3.8E-03	na	3.9E-04	5.2E-01	3.8E-03	na	3.9E-04	--	--	--	--	--	--	--	--	5.2E-01	3.8E-03	na	3.9E-04
Hexachlorobenzene ^c	0	--	--	na	2.9E-03	--	--	na	2.9E-03	--	--	--	--	--	--	--	--	--	--	na	2.9E-03
Hexachlorobutadiene ^c	0	--	--	na	1.8E+02	--	--	na	1.8E+02	--	--	--	--	--	--	--	--	--	--	na	1.8E+02
Hexachlorocyclohexane	0	--	--	na	4.9E-02	--	--	na	4.9E-02	--	--	--	--	--	--	--	--	--	--	na	4.9E-02
Hexachlorocyclohexane	0	--	--	na	1.7E-01	--	--	na	1.7E-01	--	--	--	--	--	--	--	--	--	--	na	1.7E-01
Beta-BHC ^c	0	--	--	na	1.7E-01	--	--	na	1.7E-01	--	--	--	--	--	--	--	--	--	--	na	1.7E-01
Hexachlorocyclohexane	0	--	--	na	1.8E+00	--	--	na	1.8E+00	--	--	--	--	--	--	--	--	--	--	na	1.8E+00
Gamma-BHC ^c (Lindane)	0	9.5E-01	na	na	1.8E+00	9.5E-01	--	na	1.8E+00	--	--	--	--	--	--	--	--	9.5E-01	--	na	1.8E+00
Hexachlorocyclopentadiene	0	--	--	na	1.1E+03	--	--	na	1.1E+03	--	--	--	--	--	--	--	--	--	--	na	1.1E+03
Hexachloroethane ^c	0	--	--	na	3.3E+01	--	--	na	3.3E+01	--	--	--	--	--	--	--	--	--	--	na	3.3E+01
Hydrogen Sulfide	0	--	2.0E+00	na	--	--	2.0E+00	na	--	--	--	--	--	--	--	--	--	--	2.0E+00	na	--
Indeno (1,2,3-cd) pyrene ^c	0	--	--	na	1.8E-01	--	--	na	1.8E-01	--	--	--	--	--	--	--	--	--	--	na	1.8E-01
Iron	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Isophorone ^c	0	--	--	na	9.6E+03	--	--	na	9.6E+03	--	--	--	--	--	--	--	--	--	--	na	9.6E+03
Kepone	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Lead	0	9.4E+01	1.1E+01	na	--	9.4E+01	1.1E+01	na	--	--	--	--	--	--	--	--	--	9.4E+01	1.1E+01	na	--
Malathion	0	--	1.0E-01	na	--	--	1.0E-01	na	--	--	--	--	--	--	--	--	--	--	1.0E-01	na	--
Manganese	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Mercury	0	1.4E+00	7.7E-01	--	--	1.4E+00	7.7E-01	--	--	--	--	--	--	--	--	--	--	1.4E+00	7.7E-01	--	--
Methyl Bromide	0	--	--	na	1.5E+03	--	--	na	1.5E+03	--	--	--	--	--	--	--	--	--	--	na	1.5E+03
Methylene Chloride ^c	0	--	--	na	5.9E+03	--	--	na	5.9E+03	--	--	--	--	--	--	--	--	--	--	na	5.9E+03
Methoxychlor	0	--	3.0E-02	na	--	--	3.0E-02	na	--	--	--	--	--	--	--	--	--	--	3.0E-02	na	--
Mirex	0	--	0.0E+00	na	--	--	0.0E+00	na	--	--	--	--	--	--	--	--	--	--	0.0E+00	na	--
Nickel	0	1.6E+02	1.7E+01	na	4.6E+03	1.6E+02	1.7E+01	na	4.6E+03	--	--	--	--	--	--	--	--	1.6E+02	1.7E+01	na	4.6E+03
Nitrate (as N)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Nitrobenzene	0	--	--	na	6.9E+02	--	--	na	6.9E+02	--	--	--	--	--	--	--	--	--	--	na	6.9E+02
N-Nitrosodimethylamine ^c	0	--	--	na	3.0E+01	--	--	na	3.0E+01	--	--	--	--	--	--	--	--	--	--	na	3.0E+01
N-Nitrosodiphenylamine ^c	0	--	--	na	6.0E+01	--	--	na	6.0E+01	--	--	--	--	--	--	--	--	--	--	na	6.0E+01
N-Nitrosodi-n-propylamine ^c	0	--	--	na	5.1E+00	--	--	na	5.1E+00	--	--	--	--	--	--	--	--	--	--	na	5.1E+00
Nonylphenol	0	2.8E+01	6.6E+00	--	--	2.8E+01	6.6E+00	na	--	--	--	--	--	--	--	--	--	2.8E+01	6.6E+00	na	--
Parathion	0	6.5E-02	1.3E-02	na	--	6.5E-02	1.3E-02	na	--	--	--	--	--	--	--	--	--	6.5E-02	1.3E-02	na	--
PCB Total ^c	0	--	1.4E-02	na	6.4E-04	--	1.4E-02	na	6.4E-04	--	--	--	--	--	--	--	--	--	1.4E-02	na	6.4E-04
Pentachlorophenol ^c	0	7.7E-03	5.9E-03	na	3.0E+01	7.7E-03	5.9E-03	na	3.0E+01	--	--	--	--	--	--	--	--	7.7E-03	5.9E-03	na	3.0E+01
Phenol	0	--	--	na	8.6E+05	--	--	na	8.6E+05	--	--	--	--	--	--	--	--	--	--	na	8.6E+05
Pyrene	0	--	--	na	4.0E+03	--	--	na	4.0E+03	--	--	--	--	--	--	--	--	--	--	na	4.0E+03
Radionuclides	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Gross Alpha Activity (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Beta and Photon Activity (mrem/yr)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Radium 226 + 228 (pCi/L)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Uranium (ug/l)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--

Parameter (ug/l unless noted)	Background Conc.	Water Quality Criteria				Wasteload Allocations				Antidegradation Baseline				Antidegradation Allocations				Most Limiting Allocations			
		Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH	Acute	Chronic	HH (PWS)	HH
Selenium, Total Recoverable	0	2.0E+01	5.0E+00	na	4.2E+03	2.0E+01	5.0E+00	na	4.2E+03	--	--	--	--	--	--	--	--	2.0E+01	5.0E+00	na	4.2E+03
Silver	0	2.5E+00	--	na	--	2.5E+00	--	na	--	--	--	--	--	--	--	--	--	2.5E+00	--	na	--
Sulfate	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
1,1,2,2-Tetrachloroethane ^C	0	--	--	na	4.0E+01	--	--	na	4.0E+01	--	--	--	--	--	--	--	--	--	--	na	4.0E+01
Tetrachloroethylene ^C	0	--	--	na	3.3E+01	--	--	na	3.3E+01	--	--	--	--	--	--	--	--	--	--	na	3.3E+01
Thallium	0	--	--	na	4.7E-01	--	--	na	4.7E-01	--	--	--	--	--	--	--	--	--	--	na	4.7E-01
Toluene	0	--	--	na	6.0E+03	--	--	na	6.0E+03	--	--	--	--	--	--	--	--	--	--	na	6.0E+03
Total dissolved solids	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Toxaphene ^C	0	7.3E-01	2.0E-04	na	2.8E-03	7.3E-01	2.0E-04	na	2.8E-03	--	--	--	--	--	--	--	--	7.3E-01	2.0E-04	na	2.8E-03
Tributyltin	0	4.6E-01	7.2E-02	na	--	4.6E-01	7.2E-02	na	--	--	--	--	--	--	--	--	--	4.6E-01	7.2E-02	na	--
1,2,4-Trichlorobenzene	0	--	--	na	7.0E+01	--	--	na	7.0E+01	--	--	--	--	--	--	--	--	--	--	na	7.0E+01
1,1,2-Trichloroethane ^C	0	--	--	na	1.6E+02	--	--	na	1.6E+02	--	--	--	--	--	--	--	--	--	--	na	1.6E+02
Trichloroethylene ^C	0	--	--	na	3.0E+02	--	--	na	3.0E+02	--	--	--	--	--	--	--	--	--	--	na	3.0E+02
2,4,6-Trichlorophenol ^C	0	--	--	na	2.4E+01	--	--	na	2.4E+01	--	--	--	--	--	--	--	--	--	--	na	2.4E+01
2-(2,4,5-Trichlorophenoxy) propionic acid (Silvex)	0	--	--	na	--	--	--	na	--	--	--	--	--	--	--	--	--	--	--	na	--
Vinyl Chloride ^C	0	--	--	na	2.4E+01	--	--	na	2.4E+01	--	--	--	--	--	--	--	--	--	--	na	2.4E+01
Zinc	0	1.0E+02	1.0E+02	na	2.6E+04	1.0E+02	1.0E+02	na	2.6E+04	--	--	--	--	--	--	--	--	1.0E+02	1.0E+02	na	2.6E+04

Notes:

- All concentrations expressed as micrograms/liter (ug/l), unless noted otherwise
- Discharge flow is highest monthly average or Form 2C maximum for Industries and design flow for Municipals
- Metals measured as Dissolved, unless specified otherwise
- "C" indicates a carcinogenic parameter
- Regular WLAs are mass balances (minus background concentration) using the % of stream flow entered above under Mixing Information.
Antidegradation WLAs are based upon a complete mix.
- Antideg. Baseline = (0.25(WQC - background conc.) + background conc.) for acute and chronic
= (0.1(WQC - background conc.) + background conc.) for human health
- WLAs established at the following stream flows: 1Q10 for Acute, 30Q10 for Chronic Ammonia, 7Q10 for Other Chronic, 30Q5 for Non-carcinogens and Harmonic Mean for Carcinogens. To apply mixing ratios from a model set the stream flow equal to (mixing ratio - 1), effluent flow equal to 1 and 100% mix.

Metal	Target Value (SSTV)
Antimony	6.4E+02
Arsenic	9.0E+01
Barium	na
Cadmium	5.9E-01
Chromium III	3.8E+01
Chromium VI	6.4E+00
Copper	4.5E+00
Iron	na
Lead	6.4E+00
Manganese	na
Mercury	4.6E-01
Nickel	1.0E+01
Selenium	3.0E+00
Silver	1.0E+00
Zinc	4.0E+01

Note: do not use QL's lower than the minimum QL's provided in agency guidance

VA0065358 Boston Water & Sewer WWTP

pH Maximum Values		
November-13	7.50	
October-13	7.60	
September-13	7.50	
August-13	7.40	
July-13	7.50	90th percentile value: 7.7 S.U.
June-13	7.60	
May-13	7.70	
April-13	7.40	
March-13	7.50	
February-13	7.30	
January-13	7.40	
December-12	7.50	
November-12	7.4	
October-12	7.4	
September-12	7.4	
August-12	7.1	
July-12	7.6	
June-12	7.2	
May-12	7.2	
April-12	7.4	
March-12	7.3	
February-12	7.2	
January-12	7.2	
December-11	7.2	
November-11	7.2	
October-11	7.2	
September-11	7.1	
August-11	7.4	
July-11	7.2	
June-11	7.1	
May-11	7.3	
April-11	7.2	
March-11	7.2	
February-11	7.3	
January-11	7.5	
December-10	7.1	
November-10	7.2	
October-10	7.5	
September-10	7.3	
August-10	7.6	
July-10	7.4	
June-10	7.7	
May-10	7.8	
April-10	7.6	
March-10	7.5	
February-10	7.5	
January-10	7.3	
December-09	7.5	
November-09	7.5	
October-09	7.5	
September-09	7.4	
August-09	7.2	

July-09	7.3
June-09	7.5
May-09	7.9
April-09	7.9
March-09	7.7
February-09	7.7
January-09	7.4
December-08	7.1
November-08	7.3
October-08	7.4
September-08	7.7
August-08	7.6
July-08	7.7
June-08	7.4
May-08	7.6
April-08	7.3
March-08	7.6
February-08	7.2
January-08	7.3
December-07	7.7

pH values
Feb-03

8.03
8.5
8.48
7.55
8.26
8.58
7.31
7.04
7.68
8.24
8.3
8.36
7.45
7.27
8.38
8.41
8.57
8.31
8.32
8.49
8.55
7.36
7.03
7.23
6.86
7.14
7.24
7.02
7.61
7.73
7.75
7.62
7.07
7.93
7.59
6.77
8.43
7.63
7.34
7.88
8.03
8.69
8.42
8.36
8.24
8.74
8.07
7.94
8.29
7.99
8.56

Temp values
Feb-03

4.7
4.3
4.8
5.2
4.4
5
4.4
4.2
5.2
4.4
4
4.8
3.8
3.1
3.8
2.7
5.4
4.6
4.5
4.9
4.8
4.6
4.1
9
7.6
8.3
7.5
6.4
5.9
7.2
8.2
7.1
6.1
5.2
5.1
5.5
5.4
2.9
5.6
4.2
3.5
1.8
3.4
5.4
3
3.2
3.9
0.9
3
2.9
4.6

Jan-03

Jan-03

	7.34		9.6
	7.4		8.3
Mar-02	7.89		7
	7.85	Mar-02	6.9
	7.76		6.7
	7.81		7.5
	7.9		7.1
	7.84		5.5
	7.78		7.9
	7.59		7.5
	7.25		8.6
	7.77		9.3
	8.08		10.1
	8.23		8
	8.44		8.5
	8.34		9.2
	8.41		10
	8.16		11
	7.73		12.7
	7.69		11.5
	8.02		11.3
	8.43		10.7
	8.01		10.7
	7.86		10.1
	7.99		10.1
	8.32		9.6
	8.68		9.3
	7.95		9.9
	8.21		9.6
	8.22		9.8
	8.42		10.8
Apr-02	8.33		10.7
	8.11	Apr-02	11.5
	7.83		10.3
	7.69		12
	7.42		11.7
	7.57		10.1
	7.26		10.5
	7.94		9.9
	7.62		10.4
	7.44		11.3
	7.33		12.7
	7.71		13
	7.61		14.1
	7.43		15.5
	7.91		15.1
	7.44		15.4
	7.41		17.6
	7.5		18.5
	7.64		18
	7.5		18.3
	8		18.1

	8.11		19
	7.82		20.1
	7.79		19.8
	7.48		18.6
	7.55		20.6
	7.61		20.9
	7.68		18.2
	8.26		20.8
	7.92		21.4
	7.72		22
	7.55		23
	7.59		22.9
	7.26		23.3
Jul-02	7.36		23
	7.52	Jul-02	23.4
	7.71		23.7
	7.52		24.2
	8.08		24.8
	8.23		22.9
	8.06		21
	7.14		23.3
	7.95		23.1
	7.21		23.6
	8.16		22.8
	8.02		22.7
	7.62		21.8
	7.67		21.6
	7.3		21.2
	7.73		22.2
	8.57		22.9
	7.87		23.6
	7.98		23.9
	8.57		24.1
	8.11		24.9
	8.04		23.9
	8.53		24.7
	8.62		24.4
	8.44		24.1
	7.99		23.4
	8.42		23.1
	8.23		23.6
	7.54		24.3
	7.06		24.7
Aug-02	8.19		25.2
	7.7	Aug-02	24.9
	8.09		24.6
	8.06		25.9
	8.05		25.6
	8.14		25.1
	7.82		24.5
	8.36		23.6
	7.93		22.8

	7.65		19.3
	7.4		20.4
	7.27		19.2
	7.33		18.4
	7.69		18.4
	7.89		17.7
	8.25		18.6
	8		18.9
	7.78		17.9
	7.28		15.2
	7.97		16.2
	7.72		16.2
	8.19		15.5
	7.9		15.5
	8.28		14.8
	7.96		14.2
	8.33		14.5
	7.83		14.7
	8.04		14.1
	7.84		14.2
	7.86		14.3
	8.18		13.9
	7.64		13.1
Nov-02	7.86		12
	8.61	Nov-02	12.3
	8.16		11.2
	8.3		10.9
	7.28		10.6
	8.57		11
	8.13		11.2
	7.23		10.2
	8.33		10.9
	7.65		14.6
	7.39		14.9
	7.14		14.4
	7.06		18.4
	7.13		11.3
	7.06		10.9
	8.22		11.9
	7.97		10.9
	7.53		11
	7.81		10.5
	7.66		11.4
	7.53		9.1
	7.78		9.3
	7.43		3.8
	7.71		9.6
	7.59		8.6
	8.25		8
	7.91		7.6
Dec-02	7.69		8.4
	7.03	Dec-02	7.4

	7.65		5.2
	7.84		4.6
	7.91		5
	7.96		5.1
	7.67		5.3
	7.59		5.5
	7.44		6.7
	7.74		7.9
	7.81		6.5
	7.87		4.2
	7.84		5.4
	7.55		6.9
	7.38		8.3
	6.96		5.2
	7.79		7.8
	7.07		7.2
	7.71		7
	7.34		7.6
	7.81		5.3
	7.54		5.4
	8.3		5.7
	7.82		6.9
Mar-01	7.52		5.6
	8.17	Mar-01	6.1
	7.62		6.3
	7.67		6.5
	7.58		6.6
	7.84		6.5
	7.64		5.6
	7.82		5.9
	8.24		6.1
	8.2		6.1
	7.23		6.3
	7.36		7
	7.39		7.3
	8.28		7
	7.65		7.6
	7.73		8.2
	7.61		7.9
	7.92		7.7
	7.68		7.3
	7.51		6.8
	7.62		7.9
	7.69		7.3
	7.23		8.1
	7.25		8.3
	7.32		7.9
	7.67		7.2
	7.53		5.7
	7.72		6.3
	6.91		6.8
Apr-01	7.55		7.9

	7.32	Jun-01	17.5
	7.26		18
	7.32		17.3
	7.53		17.7
	7.53		19.8
	7.58		19.2
	7.37		19.3
	7.42		20
	7.5		22.1
	7.51		20.2
	7.49		20.2
	7.22		21.1
	7.31		21.6
	7.6		22
	7.46		21.4
	7.4		21.6
	7.41		22.2
	6.47		22.1
	7.42		21.7
	7.48		21.5
	7.51		21.2
	7.42		22.6
	7.53		22
Jul-01	6.54		22.5
	7.61		23.7
	7.43	Jul-01	20.3
	7.36		21.2
	7.13		18.4
	7.7		23
	7.01		21.5
	7.26		21.7
	7.36		23.1
	7.41		21.8
	7.53		24.4
	7.48		22
	8.12		21.4
	7.53		21.6
	7.57		21.8
	7.46		22.6
	7.56		21.6
	7.59		21.9
	7.19		21.4
	7.12		20.8
	7.48		22
	7.42		21.8
	7.32		25.6
	7.38		22.4
	7.6		20.2
	7.4		21.2
	7.62		21.1
Aug-01	7.25		21.4
	7.14	Aug-01	22

	7.36		21.6
	7.34		21.8
	7.12		21.7
	7.11		16.2
	7.23		12
	7.26		13.4
	7.35		16.3
	7.46		19.9
	7.31		20.2
	7.31		18.7
	7.26		18.7
	7.48		17.9
	7.33		12.6
	7.16		16.8
	7.27		17.8
	7.39		16.3
	7.24		16
	7.19		21.6
	7.34		20.1
	7.28		13.3
	7.21		14.5
	7.61		16.7
Nov-01	7.5		13.5
	7.43	Nov-01	17
	7.01		20.1
	7.11		14.1
	7.26		16.8
	7.49		14.6
	7.32		14.1
	7.39		15.1
	7.09		16.8
	7.18		12.7
	7.24		12.4
	7.31		11.6
	7.28		15.6
	7.5		15.9
	6.68		10.3
	7.38		12.3
	7.33		16.4
	7.39		16
	7.27		15.5
	7.24		14.3
	7.43		15.3
	7.5		17.2
	7.35		16.6
	7.29		17.5
	7.33		16.2
Dec-01	7.3		16.4
	7.19	Dec-01	17.1
	7.25		13.6
	7.19		11.6
	7.24		12.3

	7.86		3.1
	7.87		3.6
	7.88		3.5
	8.22		3.6
	8.08		2.9
	8.43		4.8
	8.12		5.2
	8.25		4.1
	8.17		4.2
	8.25		4.9
	8.31		5.6
	8.39		5.2
	8.41		5.7
	8.61		8.5
	8.63		8.8
Mar-00	8.49		6.4
	8.28	Mar-00	8.3
	8.23		9.4
	8.17		8.8
	8.22		8.2
	8.1		9.1
	8.32		9.4
	8.29		10.3
	8.11		10.2
	8.23		13.1
	8.26		10.6
	7.14		10.8
	7.8		11
	7.23		10.6
	7.17		10.3
	7.77		11
	8.48		9.2
	8.54		8.8
	7.58		8.5
	7.82		8.4
	7.63		8.9
	8.16		10
	8.08		12.4
	8.03		10.6
	7.71		10.8
	7.35		10.1
	7.28		11.4
	8.23		9.3
Apr-00	7.67		10.7
	7.95	Apr-00	10.2
	8		11
	8.04		11.7
	7.67		13.3
	7.57		11.5
	8.26		11
	7.89		12.6
	8.23		13.9

	8.48		19.9
	7.83		21.5
	7.62		21.4
	7.63		21.5
	7.86		22.5
	7.85		22.8
	7.63		22.9
	8.03		22.3
	8.01		20.3
	7.48		21.3
	7.64		22.6
	8.61		21
	7.68		22.2
	7.87		22
	7.41		22.9
	8.1		23.3
	7.72		23.3
Jul-00	7.69		21.3
	8.42	Jul-00	22.6
	8.57		22.2
	8.44		23.4
	8.46		23.5
	8.43		23
	8.29		22.9
	8.06		19.4
	8.27		21.9
	7.83		22.3
	8.24		22.6
	8.24		22.7
	8.17		22.2
	8.21		21.3
	8.21		22.4
	7.86		22.5
	7.95		23.7
	7.95		22.5
	7.91		21.8
	7.5		20.3
	7.3		22
	7.91		20
	7.91		20.8
	7.72		21
	7.48		20.9
	7.64		21.4
	7.52		22.4
	7.9		22.4
	6.97		22.2
Aug-00	7.18		23.2
	7.17	Aug-00	23
	7.33		23.4
	7.41		24
	7.47		23.4
	7.84		23.9

7.81	17.5
7.62	17.8
7.51	18.1
7.62	18.5
7.7	19.8
8.02	14.2
8.21	13.8
8.11	14
7.64	13.2
7.49	14.1
7.61	13.6
7.55	10.9
7.63	11.4
7.56	16.2
7.77	15.5
7.44	15.7
7.77	15.4
7.87	15.3
7.91	17.2
7.83	15.8
7.77	14.4
7.59	14.9
7.81	15
7.73	15.1
7.62	15
7.7	17.1
7.84	15.3
8.11	14
Nov-00 7.89	13.5
7.94	14
7.84	12.7
7.92	12.5
8.01	14.1
7.72	13.5
8.01	12.3
7.59	11.4
7.76	11.6
7.74	12.7
7.22	13.8
7.79	12.6
7.96	11.5
7.86	11.6
7.73	11
8.01	10.1
8.2	10
8.29	11.4
8.14	10.1
7.92	8.4
7.91	7.9
7.89	6.8
6.98	6.1
7.1	5.7

	7.22		6.5
	7.94		9.5
	7.78		11.3
	7.9		7.2
	7.67		7.4
Dec-00	7.78		7.2
	7.88	Dec-00	6.8
	8		6.9
	7.74		7.2
	8.01		5
	7.88		4.6
	7.89		4.7
	7.92		6.3
	7.71		6.4
	7.02		4.6
	7.64		4.6
	7.43		5.1
	7.61		4.1
	7.58		4.7
	7.71		4.5
	7.52		9.7
	7.57		8.9
	7.68		4.8
	7.83		4.7
	8.16		4.3
	8.23		3.9
	8.31		3
	8.25		3.9
	8.17		3.5
	7.66		3.2
	7.93		3.9
	7.82		2.9
	7.71		2
	7.56		2.3
			0.9
90th per	8.26	90th per	22.8

	7.36		22.2
	7.54		23.2
	7.37		24.3
	7.78		23.8
	7.71		23.9
	7.4		23.8
	7.69		24.2
	7.55		22.4
	7.76		22.8
	7.84		23.2
	7.64		22.4
	7.73		22.2
	8.02		21.4
	7.54		21.2
	7.87		21.6
	7.62		21.4
	7.74		21.9
	8.36		22
	7.77		21.9
	7.64		21.4
	7.63		21.2
	7.42		23
Sep-00	7.54		22.9
	7.72	Sep-00	24.1
	8.27		25.3
	7.69		22.5
	8.2		22.7
	8.25		21.2
	8.05		20.8
	7.98		20.4
	8.53		23.7
	8.04		20.6
	8.06		21.3
	8.27		22.8
	7.94		22.2
	8.02		22.5
	8.1		22
	8.11		22.6
	7.83		20.1
	8.04		19.2
	7.99		18
	7.95		18
	7.73		19.2
	9.78		19.4
	7.9		18.8
	7.97		17.4
	8.29		17.1
	7.7		16.6
	7.72		16.1
Oct-00	7.9		19.8
	7.46	Oct-00	16
	7.65		15.8

	7.72		11.3
	7.34		11.2
	7.75		10.9
	7.9		12.2
	7.98		13.2
	7.81		13.2
	7.58		13.9
	7.8		14.3
	7.48		13.6
	7.41		12.7
	7.4		13.4
	7.68		12.8
	7.27		12.5
	7.38		13
	7.36		13.4
May-00	7.45		13.4
	6.92	May-00	12.4
	7.81		14.6
	8.01		14.4
	7.34		13.7
	7.51		16
	7.94		17.1
	7.52		17.5
	7.94		18.5
	7.5		19.5
	7.53		19.1
	7.73		20.1
	8.03		20
	8.21		17.3
	7.84		15.8
	7.74		17.7
	7.73		18.7
	7.84		19.2
	7.69		17.1
	8.25		18.3
	7.7		18.1
	7.89		20
	8.14		19.3
	7.84		17.1
	7.86		18.8
	8		18.2
	7.81		15.9
Jun-00	7.93		17.7
	7.88	Jun-00	16.9
	7.43		17.8
	7.73		19.7
	7.92		18.8
	8		18.1
	7.94		17.6
	6.9		17.4
	8.27		20.1
	7.63		20

	7.52		15.1
	7.43		13.5
	7.39		12.4
	7.58		9.6
	7.32		10.8
	7.27		12
	7.32		13.2
	7.21		12.8
	7.34		12.9
	7.28		13.3
	7.17		13.6
	7.31		14
	7.52		13.4
	7.66		8.7
	7.79		7.8
	7.36		7
	7.6		12.3
	7.94		6.9
	7.84		8.1
Jan-00	8.25		4.8
	8.3	Jan-00	6.4
	8.48		7.5
	8.29		8.5
	8.14		9.9
	8.01		8.4
	8.13		6.5
	7.25		7.7
	8.44		6.7
	7.79		6.9
	8.02		7.4
	8.34		6.5
	8.59		6.3
	8.46		5.5
	8.25		4.7
	7.5		7
	7.05		4.4
	8.25		3
	8.44		3.9
	8.17		3.7
	8.26		2
	8.79		1.54
	8.58		2.4
	8.73		1.8
	8.67		1.3
	7.9		1.4
	7.96		1.8
	7.53		2
Feb-00	8.34		3
	8.52	Feb-00	1
	7.18		2
	7.84		2.1
	7.84		2

	7.21		21.3
	7.5		21.6
	7.46		23.5
	7.36		23.9
	7.42		23.7
	7.39		23
	7.48		23.4
	7.87		24.9
	7.64		24.2
	7.43		23.8
	7.58		23.9
	7.53		22.4
	7.42		22.6
	7.35		21.3
	7.41		23.5
	7.48		22.8
	7.54		22.9
	7.73		22.8
	7.66		22.6
	7.41		23.2
	7.58		22.7
	7.36		21.6
	7.41		22.5
	7.46		22.1
Sep-01	7.48		22.7
	7.51		23
	7.43	Sep-01	22.1
	7.58		22.6
	7.62		21
	7.57		22.4
	7.29		21.3
	7.36		20.6
	7.21		21
	7.29		20.2
	7.38		19.4
	7.28		24.9
	7.41		18.9
	7.41		18
	7.36		19.7
	7.41		19.7
	7.37		19.5
	7.48		19.8
	7.32		20.6
	7.51		20.2
	7.38		20.7
	7.33		18.3
	7.41		17.2
	7.16		16.8
	7.39		16.3
Oct-01	7.26		16.3
	7.17	Oct-01	15.7
	7.24		20.3

	7.26	Apr-01	8.1
	7.46		8.6
	7.5		8.4
	7.47		9.2
	7.33		9
	7.06		9.6
	7.68		11.5
	7.66		12
	7.61		12.3
	8.06		13
	7.44		14.7
	7.09		15.1
	7.7		15.1
	7.62		15.2
	7.71		14.1
	7.24		13.5
	7.26		12.4
	7.44		12.2
	7.62		11.7
	7.58		11.8
	7.61		14.9
	7.66		14.9
	7.21		14.2
May-01	7.96		13.9
	7.64		14.9
	7.56	May-01	14.3
	7.21		15.3
	7.74		15.5
	7.45		16
	7.4		17.3
	7.13		16.6
	7.61		15.6
	7.53		15.7
	7.71		16.3
	7.64		17.3
	7.46		16.7
	7.53		16.2
	7.32		16.4
	6.8		12.8
	7.57		15
	7.62		15.2
	7.31		16.3
	7.71		16.1
	7.04		16.7
	7.26		16.4
	7.13		16.7
	7.34		16.7
	7.68		16.9
	7.49		17.6
	7.38		17.3
	7.45		17.5
Jun-01	7.46		18.1

	8		7.4
	8.01		5.4
	8.28		5.4
	8.02		5.7
	8.3		4.6
	7.96		5.1
	7.55		4.9
	7.7		8.6
	7.74		6.4
	8.13		6.7
	6.51		6.5
	7.33		6.6
	7.15		9
	7.24		9
	7.2		7.7
	7.13		7.4
	7.52		7
	7.27		9.2
	6.97		7.5
	7.5		6.4
Jan-01	7.69		7.6
	7.94		5
	7.62	Jan-01	1.9
	7.76		1.9
	7.98		1.8
	8.2		1.8
	7.75		2.4
	7.38		1.1
	7.37		2.5
	6.63		2.6
	7.57		4
	8.1		4
	7.63		5.9
	7.62		2.5
	7.48		4.6
	7.56		5.3
	7.43		5.1
	7.51		4.7
	7.57		4.1
	6.92		5.6
	7.51		5.1
	7.64		3.9
	7.71		4.2
	7.51		3.9
	6.83		3.6
	7.58		3.9
	7.81		3.8
	7.02		3.9
Feb-01	7.47		5.9
	7.59		6.2
	7.41	Feb-01	5.3
	6.99		4.6

	8.11		22.3
	8.24		22.2
	8.42		22.2
	8.09		22.8
	7.95		23.1
	7.72		24.6
	8.02		25.1
	8.16		24.5
	8.22		24.6
	7.6		24.8
	7.7		25.4
	8.19		24.7
	7.55		24.5
	7.6		24.7
	8.09		24.3
	7.71		25
	8.01		23.8
	7.76		23.7
	7.94		23.2
	7.78		22.1
	7.88		22.1
Sep-02	7.87		22.2
	7.43	Sep-02	20.5
	7.77		24.5
	7.73		22.4
	8.25		22.6
	8.28		22.1
	8.18		21.3
	7.89		22.1
	8.12		21.2
	7.78		20.8
	7.57		20.2
	7.67		20.6
	8.24		20.2
	7.69		21.6
	8.02		21.7
	7.27		21.3
	7.38		21.9
	8.13		22.3
	7.72		22.5
	8.31		22.4
	7.76		21.1
	7.7		20.2
	8.55		19.9
	7.85		19.4
	7.96		19.9
Oct-02	8.16		19.8
	8.23	Oct-02	19.7
	7.89		19.9
	8.08		19.4
	7.92		21.1
	8.07		21.1

	8.12		16.4
	8.2		15.3
	7.89		14
	7.55		15.2
	7.47		14.4
	7.56		14.3
	7.31		14.8
	7.89		15.6
May-02	8.11		16
	8.06	May-02	15.1
	8.23		15.9
	7.66		15.6
	8.06		15.4
	8.16		15.5
	8.45		16.1
	8.32		16.3
	8.16		17.4
	8.32		17.5
	7.3		17.8
	8.23		17.8
	7.83		18.4
	7.89		17.9
	7.56		16.9
	7.52		17.7
	7.55		17.9
	7.71		18
	7.39		15.4
	7.73		14.8
	7.74		14.6
	7.74		15.4
	7.58		14.4
	7.46		16.3
	7.59		17
	7.48		16.9
	7.85		19.1
	8.02		19.1
Jun-02	7.72		20
	7.41	Jun-02	21.3
	7.79		21.5
	7.63		20.8
	7.39		21.2
	7.42		21.3
	8.16		21.9
	7.3		21.3
	7.74		20.2
	7.81		20.9
	7.61		21.7
	7.79		21.3
	7.76		21.5
	7.58		20.6
	7.62		21.9
	7.53		21.8

Jan-02	7.86		5.8
	6.77	Jan-02	2.5
	7.7		2.2
	7.3		3
	6.79		6.1
	8.35		6
	7.23		5.9
	7.34		6.7
	7.21		6.8
	7.19		9.1
	7.2		6.1
	7.26		6.4
	7.31		8.9
	7.43		6.8
	7.11		6.9
	7.45		6.9
	7.4		5.5
	7.32		6.1
	7.14		6
	7.26		8
	7.22		6.9
	7.55		7.8
	7.31		8.1
	7.39		7.9
	7.61		8.5
	8.04		8.5
	7.72		9.7
	8.4		12.4
Feb-02	7.92		11.2
	8.27	Feb-02	11.8
	7.89		9.9
	7.93		9
	7.91		7.7
	7.74		7.3
	7.38		6.6
	7.26		8.4
	7.39		7.6
	8.13		7.5
	7.49		7.6
	7.26		6.7
	7.32		6.7
	7.95		7.6
	7.38		6.3
	7.19		7.7
	7.41		7.9
	7.69		7.4
	7.54		7.4
	7.16		8.3
	7.12		9
	7.04		9
	7.33		7.9
	7.28		7.7

Facility = Boston Water & Sewer
Chemical = Ammonia
Chronic averaging period = 30
WLAa = 3.2
WLAc = 0.73
Q.L. = .2
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average = 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 1.47289916819391
Average Weekly limit = 1.47289916819391
Average Monthly Limit = 1.47289916819391

The data are:

VA0065358 Ammonia STATS

1/14/2014 7:09:41 AM

Facility = Boston Water & Sewer STP
Chemical = Ammonia as N
Chronic averaging period = 30
WLAA = 14.4
WLAC = 2.1
Q.L. = .2
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 9
Variance = 29.16
C.V. = 0.6
97th percentile daily values = 21.9007
97th percentile 4 day average = 14.9741
97th percentile 30 day average = 10.8544
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 4.23710719617425
Average Weekly limit = 4.23710719617425
Average Monthly Limit = 4.23710719617425

The data are:

9

> with updated
90th percentile
pH value.

Facility = Boston Water & Sewer
Chemical = Copper
Chronic averaging period = 4
WLAa = 19.39
WLAc = 12.83
Q.L. = .3
samples/mo. = 1
samples/wk. = 1

Summary of Statistics:

observations = 1
Expected Value = 16.4
Variance = 96.8256
C.V. = 0.6
97th percentile daily values = 39.9080
97th percentile 4 day average = 27.2861
97th percentile 30 day average = 19.7792
< Q.L. = 0
Model used = BPJ Assumptions, type 2 data

A limit is needed based on Chronic Toxicity
Maximum Daily Limit = 18.764834479403
Average Weekly limit = 18.764834479403
Average Monthly Limit = 18.764834479403

The data are:

16.4

Facility = Boston Water & Sewer

Chemical = Zinc

Chronic averaging period = 4

WLAa = 126.86

WLAc = 114.91

Q.L. = .5

samples/mo. = 1

samples/wk. = 1

Summary of Statistics:

observations = 2

Expected Value = 130.2

Variance = 6102.73

C.V. = 0.6

97th percentile daily values = 316.830

97th percentile 4 day average = 216.625

97th percentile 30 day average = 157.028

< Q.L. = 0

Model used = BPJ Assumptions, type 2 data

A limit is needed based on Acute Toxicity

Maximum Daily Limit = 126.86

Average Weekly limit = 126.86

Average Monthly Limit = 126.86

The data are:

216

44.4

MEMORANDUM

State Water Control Board

2111 North Hamilton Street

P. O. Box 11143

Richmond, VA. 23230

SUBJECT: STREAM ANALYSIS - AMERICAN SECURITY COUNCIL EDUCATION
CENTER (CULPEPER COUNTY)

TO: G. Moore, NRO

FROM: B. Tuxford, BWCM *BAT*

DATE: January 29, 1980

COPIES: S. M. Billcheck, BAT

We have reviewed the stream assimilation analysis for the American Security Council Education Center discharge to the Hazel River (Culpeper County) and have no problems with the analysis as presented.

/ltc

MEMORANDUM

State Water Control Board

2111 North Hamilton Street

P. O. Box 11143

Richmond, VA. 23230

*Rec. 12/14/79
Bucm.*

1/29/80

SUBJECT: CULPEPER COUNTY: American Security Council Education Center

TO: Pat Karn

FROM: Gary N. Moore *Gary*

DATE: December 11, 1979

COPIES: Burt Tuxford - BWCN

Standards for this discharge were originally set in September, 1973. No NPDES permit was ever issued. I have run the stream model again, using current procedures and have come up with slightly different standards.

The revised effluent standards are as follows:

Flow: 0.015 mgd
BOD₅ & SS: 30 mg/l
D.O.: 6.0 mg/l

Assumptions used:

Stream temp. 30C
Saturation D.O. 7.6
K₁ @ 20C 0.215
K₂ @ 20C 3.0
Stream flow 0.989 mgd (73 sq. mi. drainage, 0.021 cfs/sq. mi. critical
discharge for Hazel Run near Rixeyville)
stream velocity 0.5 fps

GNM/da

STREAM ASSIMILATION ANALYSIS

Stream: Hazel River
 Discharge: American Security Council Education Center

Date: 12-11-79
 Topo. Sheet: Woodville
 Critical Discharge: 0.021
 Gauging Station: Hazel River
at Rixeyville

Computation Number				
Drainage Area	73.00 mi			
Stream temperature	30			
Saturation D.O.	7.6			
▶ D.O. Discharge	6			
K ₁ (carbonaceous)215			
K _n (nitrogenous)	0			
K ₂ (reaeration)3			
Flow, mgd (discharge)015			
BOD ₅ (discharge)	30			
NOD _u (discharge)	0			
Flow, mgd (stream)	0.989			
BOD ₅ (stream)	2			
NOD _u (stream)	0			
Length of segment (mi)5			
Velocity of stream (fps)5			
D.O. (allowable)	6.6			
D.O. (stream)	6.8			
Δ D.O. from allowable277			
(Red indicates violation)				
Flow (combined)	1.004			
BOD ₅ decay @ t	1.94			
NOD _u decay @ t	0			
time, days04			
D.O. @ t ("A" indicates ...)	6.88 A			

Critical D.O.)

Critical point is met in Hazel River
 Effluent limits: 30mg/l BOD₅ & SS
 6.0 mg/l D.O.

Note: At the end of each segment, if critical D.O. has not been reached, the next stream segment should be analyzed. The parameter values determined @ time = t become the new "stream" data and new flows introduced to the stream (eg: tributaries, STP discharges, stretch flows) become the new "discharge" data. [K₁, K_n and K₂ must be adjusted as necessary]

mgd = (.646)cfs

Reviewer: Gary Moore

area. ^{Re}Anal^E is OK. Original analysis was in error. No DO limit is necessary. Approve analysis - BRT 1/11/80

→ American Security Council Education Center (CULPEPER CO.)

⊕ HAZEL RIVER

✓ BRT
1/11/80

$Q_{7110} = 0.020 \text{ cfs/mi}^2$ (Thru clim. yr. 1977) BRT

$DA = 73.0 \text{ mi}^2$

$Q_{7110} = 1.46 \text{ cfs} = 0.944 \text{ mgd}$

$T = 30^\circ\text{C}$

$DO_{sat} = 7.6 \text{ mg/l}$ 90% = 6.8 mg/l

$K_{10} = 0.2 \text{ d}^{-1}$, $K_{30} = 0.296 \text{ d}^{-1}$

$K_{20} = 1.0 \text{ d}^{-1}$, $K_{30} = 1.22 \text{ d}^{-1}$

$V = 0.5 \text{ fjs}$

$L = 5.0 \text{ mi}$

$t = 0.611 \text{ d}$

DISCHARGE

$Q = 0.015 \text{ mgd}$

$DO = 6.8 \text{ mg/l}$

$BOD_5 = 24 \text{ mg/l}$

$BOD_u = 31.2 \text{ mg/l}$

STREAM

$Q = 0.944 \text{ mgd}$

$DO = 6.8 \text{ mg/l}$

$BOD_u = 2.0 \text{ mg/l}$

DO mix:

$\frac{(0.015 \times 6.8) + (0.944 \times 6.8)}{0.959} = 6.8 \text{ mg/l}$

BOD_u mix:

$\frac{(0.015 \times 31.2) + (0.944 \times 2)}{0.959} = 2.46 \text{ mg/l}$

BOD_u mix:

$\frac{(0.015 \times 39) + (0.944 \times 2)}{0.959} = 2.58 \text{ mg/l}$

DO mix:

$\frac{(0.015 \times 0) + (0.944 \times 6.8)}{0.959} = 6.69 \text{ mg/l}$

INPUT	①	②	③	④
BOD _u	2.46	2.58	2.58	3.17
NOD _u	0	0	0	0
D _u	0.8	0.8	0.91	0.91
K ₁	0.296	0.296	0.296	0.296
K ₂	0	0	0	0
K ₂	1.22	1.22	1.22	1.22
t _{trp}	0.01	0.01	0.01	0.01
DO _{sat}	7.6	7.6	7.6	7.6
OUTPUT				
t _{trp}	0.611	0.611	0.611	0.611
D _u				
DO	OK	OK	OK	
BOD _u				
NOD _u				

HAZEL R. - @ Rixeyville, L

.....Q7/10 thru 1977

11.6000
12.7000
44.4000
38.6000
63.7000
102.0000
142.0000
54.4000
26.1000
69.6000
11.1000
3.3700
23.4000
35.3000
9.6000
61.6000
36.4000
57.4000
50.3000
30.1000
5.2400
6.3700
4.4900
1.3700
8.5700
11.1000
33.6000
15.3000
62.6000
66.7000
103.0000
43.1000
78.3000
24.4000

34.0000
47.6749
74.4337
123.1344

1.4022 A
0.4794 A

0.7320 A
1.3339

5.7910 A

.....

.....

30.0000
7.6000
6.8000
0.2000
0.0000
1.0000
0.0150
30.0000
0.0000

.....

0.9440
1.5385
0.0000
5.0000
0.5000
6.6000
6.8000

0.2161

0.9590
1.6141
0.0000
0.0416
6.8162

A

.....
.....

①

2.4600	↓	1
0.0000	↓	2
0.8000	↓	3
0.2960	↓	4
0.0000	↓	5
1.2200	↓	6
0.0100	↓	7
0.0100	↓	06
7.6000	↓	09

.....

0.0100	A
0.7975	A
6.8025	A
2.4527	
0.0000	

.....

0.0200	A
0.7950	A
6.8050	A
2.4454	
0.0000	

.....

0.0300	A
0.7925	A
6.8075	A
2.4382	
0.0000	

.....

0.6110	A
0.6633	A
6.9367	A
2.0530	
0.0000	

②

2.5800	↓	1
0.0000	↓	2
0.8000	↓	3
0.2960	↓	4
0.0000	↓	5
1.2200	↓	6
0.0100	↓	7
0.0100	↓	06
7.6000	↓	09

.....

0.0100	A
0.7979	A
6.8021	A
2.5723	
0.0000	

.....

0.0200	A
0.7958	A
6.8042	A
2.5647	
0.0000	

.....

0.6110	A
0.6772	A
6.9228	A
2.1531	
0.0000	

③

2.58000	↓	1
0.00000	↓	2
0.91000	↓	3
0.29600	↓	4
0.00000	↓	5
1.22000	↓	6
0.01000	↓	7
0.01000	↓	0.6
7.60000	↓	0.9

.....

0.01000	A
0.90654	A
6.69346	A
2.57237	
0.00000	

.....

0.02000	A
0.90310	A
6.69690	A
2.56477	
0.00000	

.....

0.61100	A
0.72938	A
6.87062	A
2.15315	
0.00000	

④

3.1700	↓	1
0.0000	↓	2
0.9100	↓	3
0.2960	↓	4
0.0000	↓	5
1.2200	↓	6
0.0100	↓	7
0.0100	↓	0.6
7.6000	↓	0.9

.....

0.0100	A
0.9083	A
6.6917	A
3.1606	
0.0000	

.....

0.0200	A
0.9066	A
6.6934	A
3.1512	
0.0000	

.....

0.6110	A
0.7975	A
6.8025	A
2.6455	
0.0000	

Culpeper County, Sewerage - LHS 120; Institute for American Study,
Boston, Va., Hazel River, Rappahannock River Basin

File

Anne Christy Ellerbrake

September 24, 1973

Plans call for an extended aeration plant, 15,000 gpd flow,
on the Hazel River near Boston, Va.

Initial assumptions:

$$\begin{array}{ll} K_{a20} = 1 & K_{a30} = 1.22 \text{ day}^{-1} \\ K_{d20} = .2 & K_{d30} = .296 \text{ day}^{-1} \end{array}$$

$$\begin{array}{ll} \text{effluent BOD}_5 = 24 & \text{BOD}_u = 31 \text{ (Lu)} \\ \text{effluent D.O} = 6.8 \text{ mg/l} & \end{array}$$

$$\begin{array}{ll} \text{stream BOD}_5 = 1.5 & \text{BOD}_u = 2 \text{ (Lu)} \\ \text{stream DO (90\% saturation)} = 6.8 \text{ mg/l} & \end{array}$$

$$Q \text{ of effluent} = .015 \text{ MGD}$$

$$Q \text{ of stream (critical discharge)} = 1.13 \text{ MGD (73 sq. miles of drainage basin, .024 cfs/sq.)}$$

Discharge to Hazel River

102/

$$\begin{array}{lll} 1. \text{ Mass balance} & D_o = 6.8 \text{ mg/l} & Q = 1.145 \text{ MGD} \\ & \text{BOD}_0 = 2.38 \text{ mg/l} & \end{array}$$

$$2. \quad t_c = \text{mixing pt. is critical point}$$

Discharge of
LWS 120 - Freedom
Studies Center

Q = .015 MGD
DO = 6.8 mg/l
Lu = $24 \times 1.3 = 31 \text{ mg/l}$
Ka₃₀ = 1.22 day⁻¹
Kd₃₀ = .296 day⁻¹

to
Hazel
River

Q = 1.13
DO = 6.8 mg/l (90%
Saturation)
Lu = 2 mg/l

Mixing Pt.

Q = 1.145
DO = 6.8 mg/l
Lu = 2.38 mg/l

Mixing Pt. is critical
point,
therefore does not
degrade the waters

Page 2
September 13, 1973

STAFF RECOMMENDATIONS

The writer will perform a stream assimilative capacity analysis keeping in mind that the stream is in very good condition (super saturated at the time of inspection) and that no other discharges enter the stream above or below the discharge point.

ACE/mk

MEMORANDUM

DEPARTMENT OF ENVIRONMENTAL QUALITY

Northern Regional Office

13901 Crown Court

Woodbridge, VA 22193

(703) 583-3800

SUBJECT: TOXICS MANAGEMENT PROGRAM (TMP) DATA REVIEW
Boston Water and Sewer STP (VA0065358)
REVIEWER: Douglas Frasier
DATE: 30 December 2013

PREVIOUS REVIEW: 12 November 2013

DATA REVIEWED:

This review covers the twentieth (20th) quarterly whole effluent toxicity (WET) chronic tests conducted in November 2013 at Outfall 001.

DISCUSSIONS:

The results of these toxicity tests, along with the results of previous toxicity tests conducted on effluent samples collected from Outfall 001, are summarized in Table 1.

The chronic toxicity of the effluent samples was determined with a 3-brood daily renewal survival and reproduction test using *C. dubia* and a 7-day daily renewal survival and growth test using *P. promelas* using grab samples of the final effluent.

Statistical analyses of the test results yielded a No Observed Effect Concentration (NOEC) of 100% effluent for *P. promelas* and a NOEC of 35% for *C. dubia*.

CONCLUSION:

The chronic toxicity tests are valid and the results are acceptable. The test results indicate that the effluent samples from Outfall 001 may exhibit chronic toxicity to the *C. dubia* test species.

BIOMONITORING RESULTS
BOSTON WATER AND SEWER STP (VA0065358)

Table 1
Summary of Toxicity Test Results for Outfall 001

TEST DATE	TEST TYPE/ORGANISM	48-H LC ₅₀ (%)	NOEC (%)	% SURV	IC ₂₅ (%)	TU _c	LAB	REMARKS
12/2/98	Acute <i>C. dubia</i>	>100		100			CBI	1st quarterly
12/2/98	Acute <i>P. promelas</i>	>100		100			CBI	
11/30/98	Chronic <i>C. dubia</i>		100 S 50 R	100			CBI	
11/30/98	Chronic <i>P. promelas</i>		50 S 25 G	18			CBI	
02/22/99	Acute <i>C. dubia</i>	37.5		0			CBI	2nd quarterly
02/22/99	Acute <i>P. promelas</i>	34.2		0			CBI	
02/18/99	Chronic <i>C. dubia</i>		50 S <6.25 R	0			CBI	
02/18/99	Chronic <i>P. promelas</i>		25 S 12.5 G	0			CBI	
05/31/99	Acute <i>C. dubia</i>	>100		100			CBI	3rd quarterly
05/31/99	Acute <i>P. promelas</i>	>100		100			CBI	
05/27/99	Chronic <i>C. dubia</i>		100 S 12.5 R	80			CBI	
05/27/99	Chronic <i>P. promelas</i>		100 S 50 G	95			CBI	
TRE 8/6/99								
Permit Reissued 1 September 2003								
WET = 1.44 TU_c								
10/07/03	Chronic <i>C. dubia</i>	32.8	9 S <9 R	0	5.8	>11	CBI	1st quarterly
10/07/03	Chronic <i>P. promelas</i>	82	35 SR	13	50	2.86	CBI	
12/17/03	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	Retest
12/17/03	Chronic <i>P. promelas</i>	>100	100 SG	90	>100	1	CBI	
02/03/04	Chronic <i>C. dubia</i>	>100	69 SR	30	84.7	1.44	CBI	2nd quarterly
02/03/04	Chronic <i>P. promelas</i>	>100	100 SG	98	>100	1	CBI	
04/27/04	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	3rd quarterly
04/27/04	Chronic <i>P. promelas</i>	>100	100 SG	95	>100	1	CBI	Invalid
07/13/04	Chronic <i>C. dubia</i>	77.7	35 S 9 R	10	13.6	11	CBI	Retest
07/13/04	Chronic <i>P. promelas</i>	76.3	35 SG	13	43.1	2.86	CBI	
08/10/04	Chronic <i>C. dubia</i>	>100	100 S 9 R	90	13.8	11	CBI	4th quarterly
08/10/04	Chronic <i>P. promelas</i>	>100	100 SG	93	>100	1	CBI	
09/21/04	Chronic <i>C. dubia</i>	>100	35 SR	60	46	2.86	CBI	5th quarterly
09/21/04	Chronic <i>P. promelas</i>	>100	100 SG	83	>100	1	CBI	
12/14/04	Chronic <i>C. dubia</i>	>100	100 SR	100	91.9	1	CBI	6th quarterly
12/14/04	Chronic <i>P. promelas</i>	>100	100 SG	95	>100	1	CBI	
01/18/05	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	7th quarterly
01/18/05	Chronic <i>P. promelas</i>	>100	100 S 69 G	100	95.2	1.44	CBI	

TEST DATE	TEST TYPE/ORGANISM	48-H LC ₅₀ (%)	NOEC (%)	% SURV	IC ₂₅ (%)	TU _c	LAB	REMARKS
04/19/05	Chronic <i>C. dubia</i>	>100	100 S 69 R	70	82.8	1.44	CBI	8th quarterly
04/19/05	Chronic <i>P. promelas</i>	>100	100 SG	98	>100	1	CBI	
08/23/05	Chronic <i>C. dubia</i>	>100	100 SR	90	>100	1	CBI	9th quarterly
08/23/05	Chronic <i>P. promelas</i>	>100	100 SG	85	>100	1	CBI	
10/18/05	Chronic <i>C. dubia</i>	>100	100 SR	90	>100	1	CBI	10th quarterly
10/18/05	Chronic <i>P. promelas</i>	>100	18 SG	80	32.3	5.56	CBI	Pathogen at work
03/07/06	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1		11 th quarterly
03/07/06	Chronic <i>P. promelas</i>	>100	100 SG	100	98	1		
05/09/06	Chronic <i>C. dubia</i>	>100	100 S 69 R	90	63	1.45		12 th quarterly
05/09/06	Chronic <i>P. promelas</i>	>100	100 SG	98	>100	1		
08/15/06	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1		13 th quarterly
08/15/06	Chronic <i>P. promelas</i>	>100	100 SG	95	>100	1		
10/24/06	Chronic <i>C. dubia</i>	>100	100 SR	90	>100	1		14 quarterly
10/24/06	Chronic <i>P. promelas</i>	>100	100 SG	95	>100	1		
03/13/07	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	15 th quarterly
03/13/07	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1	CBI	
06/20/07	Chronic <i>C. dubia</i>	>100	100 S 35 R	100	58.4	2.86	CBI	16 th quarterly
06/20/07	Chronic <i>P. promelas</i>	>100	100 SG	90	>100	1	CBI	
09/11/07	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	17 th quarterly
09/11/07	Chronic <i>P. promelas</i>	>100	100 SG	93	>100	1	CBI	
10/02/07	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	18 th quarterly
10/02/07	Chronic <i>P. promelas</i>	>100	100 SG	93	>100	1	CBI	
02/19/08	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	19 th quarterly
02/19/08	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1	CBI	
06/03/08	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	20 th quarterly
06/03/08	Chronic <i>P. promelas</i>	>100	100 SG	95	>100	1	CBI	
09/09/08	Chronic <i>C. dubia</i>	>100	69 SR	60	84.2	1.45	CBI	21 st quarterly
09/09/08	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1	CBI	
12/09/08	Chronic <i>C. dubia</i>	>100	100 S 9 R	80	11.4	11.11	CBI	22 nd quarterly
12/09/08	Chronic <i>P. promelas</i>	>100	100 SG	93	>100	1	CBI	
Permit Relssued 16 December 2008								
02/10/09	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	1 st quarterly
02/10/09	Chronic <i>P. promelas</i>	>100	100 SG	93	>100	1		
05/19/09	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	2 nd quarterly
05/19/09	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1		
09/01/09	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	3 rd quarterly
09/01/09	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1		
11/10/09	Chronic <i>C. dubia</i>	100	69 SR	50	63.4	1.44	CBI	4 th quarterly
11/10/09	Chronic <i>P. promelas</i>	>100	69 SG	73	82.7	1.44		
03/16/10	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	5 th quarterly
03/16/10	Chronic <i>P. promelas</i>	>100	100 SG	98	>100	1		
06/22/10	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	6 th quarterly
06/22/10	Chronic <i>P. promelas</i>	>100	100 SG	98	>100	1		
08/03/10	Chronic <i>C. dubia</i>	>100	100 S 35 R	100	31.3	2.86	CBI	7 th quarterly
08/03/10	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1		

TEST DATE	TEST TYPE/ORGANISM	48-H LC ₅₀ (%)	NOEC (%)	% SURV	IC ₂₅ (%)	TU _c	LAB	REMARKS
12/14/10	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	8 th quarterly 2 nd sample contained copious amounts of solids due to frozen RAS pipe; affecting the growth.
12/14/10	Chronic <i>P. promelas</i>	>100	100 S 18 G	98	>100	5.56		
02/08/11	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	9 th quarterly
02/08/11	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1		
05/16/11	Chronic <i>C. dubia</i>	>100	100 S 69 R	100	61.5	1.45	CBI	10 th quarterly
05/16/11	Chronic <i>P. promelas</i>	>100	100 SG	98	>100	1		
09/27/11	Chronic <i>C. dubia</i>	>100	100 S 35 R	100	61.1	2.86	CBI	11 th quarterly
09/27/11	Chronic <i>P. promelas</i>	>100	100 SG	95	>100	1		
11/28/11	Chronic <i>C. dubia</i>	>100	100 S 69 R	100	80.7	1.45	CBI	12 th quarterly
11/28/11	Chronic <i>P. promelas</i>	>100	100 SG	88	>100	1		
03/20/12	Chronic <i>C. dubia</i>	>100	100 SR	90	>100	1	CBI	13 th quarterly
03/20/12	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1		
06/26/12	Chronic <i>C. dubia</i>	>100	100 S <9 R	70	3.86	> 11	CBI	14 th quarterly
06/26/12	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1		
09/25/12	Chronic <i>C. dubia</i>	>100	100 SR	80	>100	1	CBI	15 th quarterly
09/25/12	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1		
11/13/12	Chronic <i>C. dubia</i>	>100	100 S 18 R	100	13.9	5.56	CBI	16 th quarterly
11/13/12	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1		
03/19/13	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	17 th quarterly
03/19/13	Chronic <i>P. promelas</i>	>100	100 SG	98	>100	1		
03/19/13	Acute <i>C. dubia</i>	>100	NA	100	NA		CBI	Filtered comparison sample
03/19/13	Acute <i>P. promelas</i>	>100	NA	100	NA			
06/25/13	Chronic <i>C. dubia</i>	>100	100 S <9 R	100	3.7	>11	CBI	18 th quarterly
06/25/13	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1		
09/28/13	Chronic <i>C. dubia</i>	>100	100 SR	100	>100	1	CBI	19 th quarterly
09/28/13	Chronic <i>P. promelas</i>	>100	100 SG	95	>100	1		
11/12/13	Chronic <i>C. dubia</i>	>100	100 S 35 R	67	67.2	2.85	CBI	20 th quarterly
11/12/13	Chronic <i>P. promelas</i>	>100	100 SG	100	>100	1		

FOOTNOTES:

A bold faced value for LC₅₀ or NOEC indicates the test failed the toxicity criteria.
LC₅₀ based on observation at the end of 48 hours.

ABBREVIATIONS:

S – Survival; R – Reproduction; G – Growth
INV – Invalid test
% SURV – Percent survival in 100% effluent
CBI – Coastal Bioanalysts, Incorporated



December 6, 2013



Mr. Ed Stuart, Compliance Manager
Department of Environmental Quality
Northern Regional Office
13901 Crown Court
Woodbridge, VA 22193

RE: Boston Water & Sewer Quarterly Toxicity Report
VPDES Permit Number VA0065358

Dear Ed,

The attached report contains toxicity testing data for the November 2013 sampling quarter. Please note that all parameters were within acceptable ranges with the exception of *C. dubia*, Chronic - NOEC (R). The test result for this parameter is 35% for reproduction, which equates to a T.U.c of 2.85. Additional samples were collected from both the CCA printing facility and Longlea conference center during the bioassay sampling event. The results of these tests are shown in the following table. As can be seen there is nothing highly unusual with any of the results with the exception of elevated Zinc concentrations at both facilities. Although the concentrations are elevated, it is inconclusive as to whether the levels found would contribute to the toxicity failure. Also, there was one elevated pH measured at the Longlea conference center sample point, but again, with the amount of mixing and dilution from the sample point to the plant final effluent, it is unlikely that pH alone would be a contributor to the problem.

Pump Station

DATE	BOD (mg/L)	TSS (mg/L)	TR Cu (mg/L)	TR Zn (mg/L)	COD (mg/L)	Field pH (S.U.)
11/10/2013	71	31.5	0.0085	0.0321	164	8.35
11/11/2013	47	10.1	0.0138	0.0245	119	8.35
11/12/2013	329	200	0.0201	0.1260	576	8.07
11/13/2013	179	42.6	0.03610	0.0578	428	8.23
11/14/2013	169	134	0.0220	0.1330	269	7.22

Pre-Post Aeration

DATE	BOD (mg/L)	TSS (mg/L)	TR Cu (mg/L)	TR Zn (mg/L)	COD (mg/L)	Field pH (S.U.)
11/10/2013	<2	2.6	0.0095	0.0800	26.8	6.82
11/11/2013	<2	2.63	0.0098	0.0678	29.8	7.11
11/12/2013	<2	4.58	0.0091	0.0676	32.9	7.30
11/13/2013	3	11.1	0.0145	0.1300	54.4	6.83
11/14/2013	3	6.42	0.0118	0.1070	72.8	6.52

Manhole

DATE	BOD (mg/L)	TSS (mg/L)	TR Cu (mg/L)	TR Zn (mg/L)	COD (mg/L)	Field pH (S.U.)
11/10/2013	200	44.8	0.0115	0.3980	250	10.63
11/11/2013	No Flow					
11/12/2013	No Flow					
11/13/2013	449	731	0.0375	0.116	1380	7.95

It must also be noted that the elevated concentrations of Zinc occurred well upstream of the final discharge point. Zinc concentrations measured at the post aeration chamber were lower and at a concentration that would probably not create a problem. The possibility exists that some other contaminant in the wastewater stream is causing the problem, but this has not been confirmed. An extensive investigation is currently underway in an effort to isolate the cause of the failures. A report containing any findings will be submitted to the DEQ within the next thirty days. If you have questions or require additional information, please feel free to contact me.

Best regards,


Donald F. Hearl
Vice President

EC: Ed O'Brien, Boston Water & Sewer
Alison Thompson, DEQ Senior Permit Reviewer



**BOSTON WATER & SEWER CO.
(CCA)**

VPDES PERMIT NO. VA0065358

**TOXICITY TESTING RESULTS
OUTFALL 001**

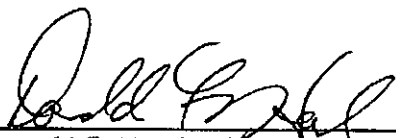
NOVEMBER 2013



The analytical raw data and test results included in this report have been prepared by Coastal Bioanalysts, Inc. The data were reviewed and approved by authorized personnel at Environmental Systems Service, Ltd.

The completed and bound report was prepared by Environmental Systems Service, Ltd.

Reviewed and approved by:


Donald F. Hearl, Vice President

Nov 22, 2013
Date

INTRODUCTION

Toxicity testing requirements of VPDES Permit No. VA0065358 and the toxicity testing represented by this report are as follows:

Chronic <i>Ceriodaphnia dubia</i>	Survival and Reproduction
Chronic <i>Pimephales promelas</i>	Survival and Biomass/Growth

EFFLUENT INFORMATION

FACILITY NAME: Boston Water & Sewer Company

LOCATION: 5545 Security Circle
Boston, Virginia 22713

OUTFALL: Outfall 001

SAMPLE TYPE: Grab

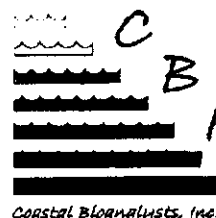
COLLECTION DATES AND TIMES: 11/11/2013 @ 0840
11/12/2013 @ 0745
11/14/2013 @ 0900

METHOD OF DELIVERY TO COASTAL: UPS Next Day

TEST	RESULT	T.U. c
Chronic <i>C. dubia</i>	NOEC (S) = 100%	1.00
	NOEC (R) = 35%	2.85
Chronic <i>P. promelas</i>	NOEC (S) = 100%	1.00
	NOEC (B) = 100%	1.00

CHRONIC TOXICITY RESULTS

Client: Environmental Systems Service, LTD.
 Project ID: ESSL1320
 Client Sample ID: Boston Water & Sewer/CCA
 Permit No: VA0065358
 Sample Period: 11/11/13 to 11/14/13, WO 25785



Report of Analysis: Whole Effluent Toxicity (WET)

Submitted To: Ms. Angie Woodward Environmental Systems Service, LTD. 218 North Main Street, P.O. Box 520 Culpeper, VA 22701	Prepared By: Coastal Bioanalysts, Inc. 6400 Enterprise Court Gloucester, VA 23061 (804) 694-8285 www.coastalbio.com Contact: Peter F. De Lisle, Technical Director
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Chronic Test Results										
Species-Test Method	Endpoint	NOEC	LOEC	ChrV	PMSD	T.U. _c	IC25	48-h LC50	LC50 95% C.L.	T.U. _{ac}
<i>C. dubia</i>	Survival	100	>100	>100	N/A	1.00	N/A	>100	N/A	<1.00
EPA 1002.0	Reproduction	35	69	49.1	25	2.85	67.2	N/A	N/A	N/A
<i>P. promelas</i>	Survival	100	>100	>100	N/A	1.00	N/A	>100	N/A	<1.00
EPA 1000.0	Biomass	100	>100	>100	12	1.00	>100	N/A	N/A	N/A

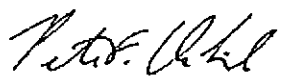
Note: Details regarding test conduct and data analysis provided in attached bench sheets and printouts as applicable. There were no significant differences between SFW and UV Controls.

Chronic Test QA/QC Reference Toxicant: KCl Units: mg/l Test Organism Source: CBI Stock Cultures										
Species-Method (Ref. Test Date)	Data Source	% Survival		Reproduction (# Young) or Biomass (mg)					RTT in Control?	
		Cont.	NOEC	Cont.	NOEC	PMSD	IC25	IC25 A.L.		
<i>C. dubia</i> 1002.0	RTT	100	500	30.2	250	16	364	N/A	Yes	
(11/1/13-11/7/13)	CC	98	500	26.3	250	23	333	251-414		
<i>P. promelas</i> 1000.0	RTT	98	500	0.60	500	9	618	N/A	Yes	
(11/1/13-11/8/13)	CC	98	500	0.68	500	14	614	569-659		

Note: RTT = Reference Toxicant Test, CC = Control Chart, Cont. = Control group.

The results of analysis contained within this report relate only to the sample as received in the laboratory. This report shall not be reproduced except in full without written approval from the laboratory. Unless noted below, these test results meet all requirements of NELAP.

APPROVED:

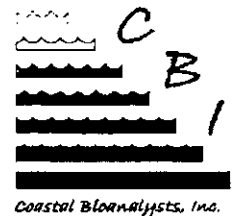

 Peter F. De Lisle, Ph.D.
 Technical Director

11/21/13
 Date

Deviations from, additions to, or exclusions from the test method, non-standard conditions or data qualifiers and, as appropriate, a statement of compliance/non-compliance: NONE



Client: Environmental Systems Service, LTD.
Project ID: ESS1320
Client Sample ID: Boston Water & Sewer/CCA
Permit No: VA0065358
Sample Period: 11/11/13 to 11/14/13, WO 25785



GLOSSARY OF TERMS AND ABBREVIATIONS

A.L. (Acceptance Limits): The results of a given reference toxicant test are compared to the control chart mean value ± 2 standard deviations. These limits approximate the 95% probability limits for the "true" reference toxicant value.

Chronic Value (ChrV): The geometric mean of the NOEC and LOEC. Units are same as test concentration units.

C.L. (Confidence Limits): These are the probability limits, based on the data set and statistical model employed, that the "true value" lies within the limits specified. Typically limits are based on 95% or 99% probabilities.

Control chart: A cumulative summary chart of results from QC tests with reference toxicants. The results of a given reference toxicant test are compared to the control chart mean value and 95% Acceptance Limits (A.L.) (mean ± 2 standard deviations).

IC25: The concentration of sample or chemical, calculated from the data set using statistical models, causing a 25% reduction in test organism growth, reproduction, etc. The lower the IC25, the more toxic the chemical or sample. Units are same as test concentration units.

LC50: The concentration of sample or chemical, calculated from the data set using statistical models, causing a 50% reduction in test organism survival. The lower the LC50, the more toxic the chemical or sample. Units are same as test concentration units. Note: The LC50 value must always be associated with the duration of exposure. Thus 48-h LC50, 96-h LC50, etc. are calculated.

LOEC: Lowest-observable-effect-concentration. The lowest concentration of sample or chemical in a chronic test dilution series in which the test organisms exhibit a statistically significant reduction in any of the test end points (e.g. growth, survival, reproduction) compared to control organisms. Units are same as test concentration units.

PMSD: Percent Minimum Significant Difference: The minimum difference which can exist between a test treatment and the controls in a particular test and be statistically significant; a measure of test sensitivity. The lower the PMSD the more sensitive the test.

N/A: Not applicable.

N/D: Not determined or measured.

NOAEC: No-observable-acute-effect-concentration. The highest concentration of sample or chemical in an acute test dilution series in which the test organisms exhibit no statistically significant reduction in the test end point (e.g. survival) compared to control organisms. Units are same as test concentration units.

NOEC: No-observable-effect-concentration. The highest concentration of sample or chemical in a chronic test dilution series in which the test organisms exhibit no statistically significant reduction in any of the test end points (e.g. growth, survival, reproduction) compared to control organisms. Some regulatory definitions also require that the NOEC be less than the LOEC. Units are same as test concentration units.

Q.L.: Quantitation Limit. Level, concentration, or quantity of a target variable (analyte) that can be reported at a specified degree of confidence.

T.U.: Toxic units. Expresses the relative toxicity of an effluent in such a manner that the larger the toxic unit value the more toxic the effluent. $T.U._{AC} = 100/LC50$. $T.U._{Chr} = 100/NOEC$ or $100/IC25$. A dimensionless unit.



RAW DATA / BENCH SHEETS

Ceriodaphnia test set up bench sheet (EPA METHOD 1002.0) Template version CCD 5trt 061013

Test chamber:	-30 ml glass vial:	<input checked="" type="checkbox"/>	Illumination & photoperiod:	50-100 ft-c 16L:8D
	Other:		Number of replicates/treatment:	10
Test solution volume:	15 ml:	<input checked="" type="checkbox"/>	Initial number animals/replicate:	1
	Other (ml):		Template #:	26

CHANGES & NOTES (INITIALS, DATE, SPECIFIC CHANGE MADE)	
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SPECIES:	Ceriodaphnia dubia
ACCLIMATION WATER:	Mod. Hard Synthetic Freshwater
FEEDING (Culture & Test):	YCT + Selenastrum capricornutum mix
SOURCE:	CBI Stock cultures
ACCLIMATION TEMP (°C):	25
BROOD RELEASE FROM:	11/11/13 22:00
BROOD RELEASE TO:	11/12/13 6:00
DATE/TIME WATER ADDED:	11/12/13 14:03
DATE/TIME ANIMALS ADDED:	11/12/13 14:17
ANIMAL AGE WINDOW (TAC 8 h):	
MAX AGE AT TEST START (TAC 24 h):	
TEST SET UP BY:	BJA
TEST ID:	ESSL1320CCD
PEER REVIEW BY (Initial/Date):	PB 11/20/13 15:0

Ceriodaphnia daily water quality bench sheet (EPA METHOD 1002.0) Template version CCD 5trt 061013

															SUMMARY WATER QUALITY DATA			
															MEAN	S.D.	MIN.	MAX.
pH (9.0)	C	7.86	8.52	7.94	8.55	7.85	8.10	7.89	7.92	7.78	8.32	7.81	8.37	8.08	0.29	7.78	8.55	
	1	7.81	8.62	7.83	8.63	7.79	8.43	7.77	8.22	7.67	8.29	7.73	8.21	8.08	0.36	7.87	8.63	
	2	7.76	8.59	7.72	8.58	7.73	8.40	7.67	7.97	7.57	8.22	7.63	8.27	8.00	0.37	7.57	8.58	
	3	7.65	8.41	7.55	8.50	7.61	8.31	7.49	7.97	7.39	8.21	7.48	8.05	7.89	0.40	7.39	8.50	
	4	7.51	8.35	7.31	8.36	7.45	8.22	7.22	7.77	7.13	8.05	7.23	7.97	7.71	0.46	7.13	8.36	
	5	7.40	8.24	7.16	8.32	7.33	8.21	6.99	7.62	6.91	7.79	7.03	7.76	7.56	0.51	6.91	8.32	
Temp. (°C)	C	24	24	24	25	25	25	24	25	24	25	24	25	25	0.8	24	25	
	1	24	24	24	25	25	25	24	25	24	25	24	25	25	0.5	24	25	
	2	24	24	24	25	25	25	24	25	25	25	24	25	25	0.5	24	25	
	3	24	24	24	25	25	25	25	25	25	25	25	25	25	0.5	24	25	
	4	24	24	24	25	25	25	25	25	25	25	25	25	25	0.8	24	25	
	5	24	24	24	25	25	25	25	25	25	25	25	25	25	0.5	24	25	
D.O. (mg/L)	C	8.3	8.4	8.3	8.5	8.2	8.2	8.1	7.5	7.6	8.2	8.1	8.5	8.2	0.3	7.5	8.5	
	1	8.3	8.7	8.3	8.8	8.2	8.2	8.0	7.9	7.6	8.6	8.0	8.5	8.3	0.4	7.6	8.8	
	2	8.3	8.7	8.3	8.9	8.2	8.4	7.8	7.4	7.5	8.8	7.9	8.5	8.2	0.6	7.4	8.9	
	3	8.3	8.6	8.3	8.9	8.2	8.6	7.7	7.8	7.5	8.7	7.8	8.5	8.2	0.4	7.5	8.9	
	4	8.3	8.6	8.2	8.9	8.2	8.6	7.6	7.9	7.6	8.9	7.8	8.5	8.3	0.5	7.6	8.9	
	5	8.3	8.6	8.1	8.9	8.2	8.6	7.5	8.0	7.7	9.1	7.8	8.6	8.3	0.5	7.5	9.1	
D.O. (mg/L)	C	303		298		297		292		291		294		296	4.4	291	303	
	1	342		335		335		335		336		330		336	3.8	330	342	
	2	381		371		375		379		372		372		375	4.1	371	381	
	3	452		443		443		446		449		447		447	3.5	443	452	
	4	590		576		577		590		569		583		584	8.5	576	590	
	5	718		702		702		716		717		708		711	7.6	702	718	
Benthic Index	S	C	S	I	S	E	S	A	S	D	S	B		NOTE: Final D.O. values > 8.3 mg/L (saturation) may occur due to photosynthetic activity of algal food.				
	BJA	BJA	BJA	RCD	KK	RCD	GB											
Changes & Notes (Initials, date, specific change or notes)																		
<div style="display: flex; justify-content: space-between;"> TRT ID: 1 2 3 4 5 CONC: 8.00% 16.0% 35.0% 69.0% 100% </div>																		

		0	0	0	0	0	0	0
		0	0	0	0	5	12	12
		0	0	0	0	5	12	12
		0	0	0	0	3	10	16
		0	0	0	0	3	12	12
		0	0	0	0	6	12	16
		0	0	0	0	4	12	14
		0	0	0	0	6	12	12
		0	0	0	0	4	12	12
		0	0	0	6	0	12	14
A		0	0	0	4	0	12	14
B		0	0	0	4	0	12	14
C		0	0	0	0	4	14	16
D	9.00%	0	0	0	0	5	12	16
E		0	0	0	0	4	14	12
F	Vol. Exp.	0	0	0	0	3	12	14
G		0	0	0	0	6	14	14
H		0	0	0	0	5	12	16
I		0	0	0	0	3	12	14
J		0	0	0	6	0	12	14
		0	0	0	5	0	12	14
		0	0	0	0	4	12	12
		0	0	0	0	4	12	6
		0	0	0	0	4	12	14
		0	0	0	0	1	10	14
		0	0	0	0	4	12	14
		0	0	0	0	4	14	12
		0	0	0	0	5	12	10
		0	0	0	0	3	12	14
		0	0	0	6	0	12	10
		0	0	0	4	0	12	12
		0	0	0	0	5	12	10
		0	0	0	0	3	8	0
		0	0	0	0	6	10	12
		0	0	0	0	4	12	14
		0	0	0	0	4	12	14
		0	0	0	0	6	12	16
		0	0	0	0	3	12	8
		0	0	0	0	4	12	12
		0	0	0	6	0	14	12
		0	0	0	0	2	0	10
		0	0	0	0	6	10	10
		0	0	0	0	4	12	14
		0	0	0	0	6	8	10
		0	0	0	0	3	6	0
		0	0	0	2	2	12	12
		0	0	0	0	2	8	10
		0	0	0	0	3	12	10
		0	0	0	0	0	6	10
		0	0	0	6	0	12	8
A		0	0	0	0	1	4	10
B		0	0	0	0	2	8	10
C		0	0	0	0	0	0	0
D	100%	0	0	0	0	0	0	8
E		0	0	0	0	0	0	12
F	Vol. Exp.	0	0	0	0	3	4	16
G		0	0	0	0	0	0	0
H		0	0	0	0	0	0	0
I		0	0	0	0	0	5	10
J		0	0	0	0	0	0	0
	BJA	BJA	BJA	RCD	KK	RCD	GB	
	11/12/13 14:47	11/13/13 13:15	11/14/13 14:39	11/15/13 14:00	11/16/13 13:23	11/17/13 14:40	11/18/13 14:07	
	A	B	B	C	C	C		
CHANGES & NOTES (INITIALS, DATE, SPECIFIC CHANGE MADE)								
Avg. young/surviving control (TAG 15 min):								
Surv. controls with 3 broods:								
9								

SAMPLE COLLECTION

SAMPLE	COLLECTION DATE & TIME

SAMPLE AGING

11/13/13 13:15

11/14/13 14:39

11/15/13 14:00

11/17/13 14:40

	A	B	C	D	E	F	G	H	I	J
1	1	1	1	1	0	0	0	0	F	
2	1	1	1	1	1	1	1	1	F	
3	1	1	1	1	1	1	1	1	F	
4	1	1	1	1	1	1	1	1	F	
5	1	1	1	1	1	1	1	1	F	
6	1	1	1	1	1	1	1	1	F	
7	1	1	1	1	1	1	1	1	F	
8	1	1	1	1	1	1	1	1	F	
9	1	1	1	1	1	1	1	1	F	
10	1	1	1	1	1	1	1	1	F	
11	1	1	1	1	1	1	1	1	F	
12	1	1	1	1	1	1	1	1	F	
13	1	1	1	1	1	1	1	1	F	
14	1	1	1	1	1	1	1	1	F	
15	1	1	1	1	1	1	1	1	F	
16	1	1	1	1	1	1	1	1	F	
17	1	1	1	1	1	1	1	1	F	
18	1	1	1	1	1	1	1	1	F	
19	1	1	1	1	1	1	1	1	F	
20	1	1	1	1	1	1	1	1	F	
21	1	1	1	1	1	1	1	1	F	
22	1	1	1	1	1	1	1	1	F	
23	1	1	1	1	1	1	1	1	F	
24	1	1	1	1	1	1	1	1	F	
25	1	1	1	1	1	1	1	1	F	
26	1	1	1	1	1	1	1	1	F	
27	1	1	1	1	1	1	1	1	F	
28	1	1	1	1	1	1	1	1	F	
29	1	1	1	1	1	1	1	1	F	
30	1	1	1	1	1	1	1	1	F	
31	1	1	1	1	1	1	1	1	F	
32	1	1	1	1	1	1	1	1	F	
33	1	1	1	1	1	1	1	1	F	
34	1	1	1	1	1	1	1	1	F	
35	1	1	1	1	1	1	1	1	F	
36	1	1	1	1	1	1	1	1	F	
37	1	1	1	1	1	1	1	1	F	
38	1	1	1	1	1	1	1	1	F	
39	1	1	1	1	1	1	1	1	F	
40	1	1	1	1	1	1	1	1	F	
41	1	1	1	1	1	1	1	1	F	
42	1	1	1	1	1	1	1	1	F	
43	1	1	1	1	1	1	1	1	F	
44	1	1	1	1	1	1	1	1	F	
45	1	1	1	1	1	1	1	1	F	
46	1	1	1	1	1	1	1	1	F	
47	1	1	1	1	1	1	1	1	F	
48	1	1	1	1	1	1	1	1	F	
49	1	1	1	1	1	1	1	1	F	
50	1	1	1	1	1	1	1	1	F	
51	1	1	1	1	1	1	1	1	F	
52	1	1	1	1	1	1	1	1	F	
53	1	1	1	1	1	1	1	1	F	
54	1	1	1	1	1	1	1	1	F	
55	1	1	1	1	1	1	1	1	F	
56	1	1	1	1	1	1	1	1	F	
57	1	1	1	1	1	1	1	1	F	
58	1	1	1	1	1	1	1	1	F	
59	1	1	1							

Ceriodaphnia Survival and Reproduction Test-6 Day Survival

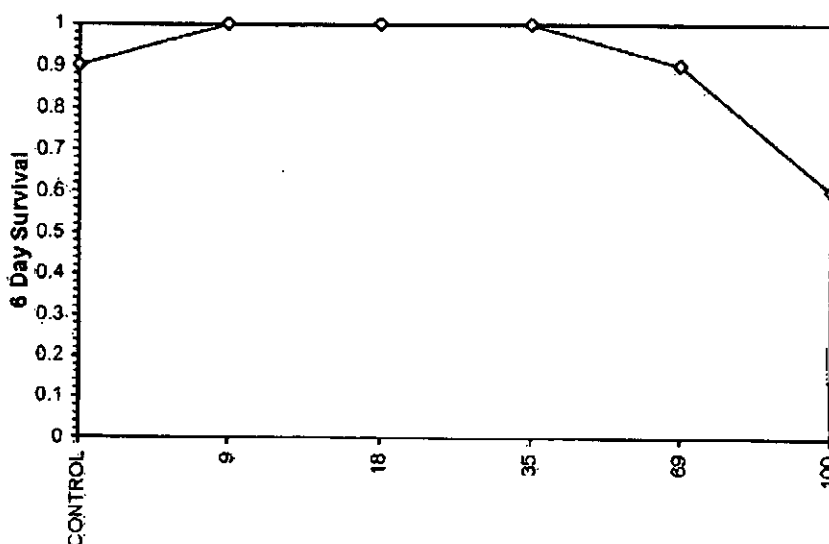
Start Date: Test ID: ESSL1320CD Sample ID:
End Date: Lab ID: CBI Sample Type:
Sample Date: Protocol: EPAF 94-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
Comments: DATA ENTERED BY PB

Conc-%	1	2	3	4	5	6	7	8	9	10
CONTROL	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
18	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
35	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
69	1.0000	1.0000	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	0.0000	1.0000	1.0000	1.0000	0.0000	0.0000	1.0000	0.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical
CONTROL	0.9000	1.0000	1	9	10	10		
9	1.0000	1.1111	0	10	10	10	0.5000	0.0500
18	1.0000	1.1111	0	10	10	10	0.5000	0.0500
35	1.0000	1.1111	0	10	10	10	0.5000	0.0500
69	0.9000	1.0000	1	9	10	10	0.7632	0.0500
100	0.6000	0.6667	4	6	10	10	0.1517	0.0500

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	100	>100		1

Dose-Response Plot



Ceriodaphnia Survival and Reproduction Test-Reproduction

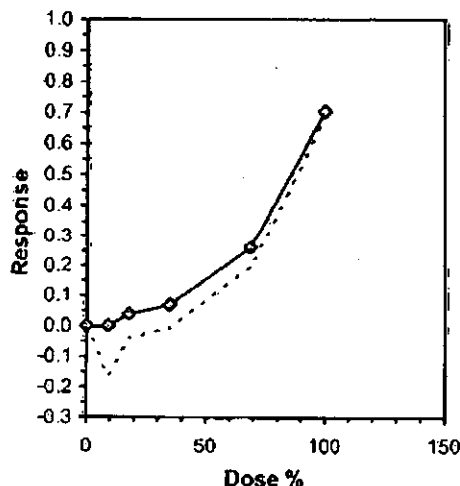
Start Date: Test ID: ESS1320CD Sample ID:
End Date: Lab ID: CBI Sample Type:
Sample Date: Protocol: EPAF 94-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
Comments: DATA ENTERED BY PB

Conc-%	1	2	3	4	5	6	7	8	9	10
CONTROL	0.000	30.000	30.000	29.000	27.000	34.000	30.000	30.000	28.000	32.000
9	30.000	30.000	34.000	33.000	30.000	29.000	34.000	33.000	29.000	32.000
18	32.000	28.000	22.000	30.000	25.000	30.000	30.000	27.000	29.000	28.000
35	28.000	27.000	12.000	28.000	30.000	30.000	34.000	23.000	28.000	32.000
69	12.000	26.000	30.000	24.000	9.000	28.000	20.000	25.000	16.000	26.000
100	15.000	20.000	0.000	8.000	12.000	17.000	0.000	0.000	15.000	0.000

Conc-%	Mean	N-Mean	Transform: Untransformed				N	Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%				Mean	N-Mean
CONTROL	27.000	1.0000	27.000	0.000	34.000	35.866	10			29.200	1.0000
9	31.400	1.1630	31.400	29.000	34.000	6.405	10	125.50	75.00	29.200	1.0000
18	28.100	1.0407	28.100	22.000	32.000	10.266	10	93.50	75.00	28.100	0.9623
35	27.200	1.0074	27.200	12.000	34.000	22.450	10	96.00	75.00	27.200	0.9315
*69	21.600	0.8000	21.600	9.000	30.000	32.824	10	71.50	75.00	21.600	0.7397
*100	8.700	0.3222	8.700	0.000	20.000	93.073	10	63.00	75.00	8.700	0.2979

Auxiliary Tests				Statistic	Critical	Skew	Kurt
Kolmogorov D Test indicates non-normal distribution ($p \leq 0.01$)				1.30437	1.035	-1.7239	5.03141
Bartlett's Test indicates unequal variances ($p = 1.87E-04$)				24.3312	15.0863		
Hypothesis Test (1-tail, 0.05)				NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test				35	69	49.1426	2.85714

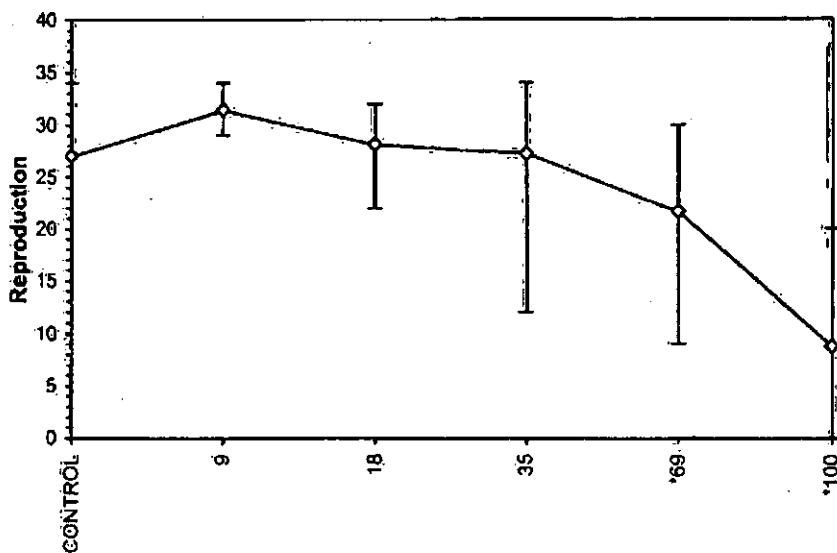
Linear Interpolation (200 Resamples)					
Point	%	SD	95% CL	Skew	
IC05	24.800	11.630	12.456	47.424	0.5893
IC10	40.586	12.348	15.913	64.308	0.0922
IC15	49.450	11.412	25.218	71.161	0.0235
IC20	58.314	10.563	36.271	73.653	-0.2345
IC25	67.179	8.393	47.625	76.218	-0.7548
IC40	78.805	4.394	68.116	85.770	-0.6941
IC50	85.822				



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: Test ID: ESSL1320CD Sample ID:
End Date: Lab ID: CBI Sample Type:
Sample Date: Protocol: EPAF 94-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
Comments: DATA ENTERED BY PB

Dose-Response Plot



Ceriodaphnia Survival and Reproduction Test-Reproduction

Start Date: Test ID: ESS1320CD Sample ID:
 End Date: Lab ID: CBI Sample Type:
 Sample Date: Protocol: EPAF 94-EPA Freshwater Test Species: CD-Ceriodaphnia dubia
 Comments: DATA ENTERED BY PB

Conc-%	1	2	3	4	5	6	7	8	9	10
CONTROL	0.000	30.000	30.000	29.000	27.000	34.000	30.000	30.000	28.000	32.000
9	30.000	30.000	34.000	33.000	30.000	29.000	34.000	33.000	29.000	32.000
18	32.000	28.000	22.000	30.000	25.000	30.000	30.000	27.000	29.000	28.000
35	28.000	27.000	12.000	28.000	30.000	30.000	34.000	23.000	28.000	32.000
69	12.000	26.000	30.000	24.000	9.000	28.000	20.000	25.000	16.000	26.000
100	15.000	20.000	0.000	8.000	12.000	17.000	0.000	0.000	15.000	0.000

Conc-%	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed	
			Mean	Min	Max	CV%	N		Critical	MSD
CONTROL	27.000	1.0000	27.000	0.000	34.000	35.866	10			
9	31.400	1.1630	31.400	29.000	34.000	6.405	10	-1.497	2.287	6.722
18	28.100	1.0407	28.100	22.000	32.000	10.266	10	-0.374	2.287	6.722
35	27.200	1.0074	27.200	12.000	34.000	22.450	10	-0.068	2.287	6.722
69	21.600	0.8000	21.600	9.000	30.000	32.824	10	1.837	2.287	6.722
*100	8.700	0.3222	8.700	0.000	20.000	93.073	10	6.225	2.287	6.722

Auxiliary Tests						Statistic	Critical	Skew	Kurt						
Kolmogorov D Test indicates non-normal distribution (p <= 0.01)						1.30437	1.035	-1.7239	5.03141						
Bartlett's Test indicates unequal variances (p = 1.87E-04)						24.3312	15.0863								
Hypothesis Test (1-tail, 0.05)						NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test						69	100	83.0662	1.44928	6.72226	0.24897	661.32	43.2111	2.4E-09	5, 54

Dunnett's test for PMSD only-pd

Fathead minnow test set up bench sheet (EPA METHOD 1000.0) Template version CPP UV 070113

Test chamber: 1000 ml Poly Beaker	<input checked="" type="checkbox"/>	Illumination & photoperiod:	50-100 ft-c 16L:8D
Other:	<input type="checkbox"/>	Number of replicates/treatment:	4
Test solution vol. (250 ml min): 500 ml	<input checked="" type="checkbox"/>	Initial number animals/replicate:	10
Other (ml):	<input type="checkbox"/>		
CHANGES & NOTES (INITIALS, DATE, SPECIFIC CHANGE MADE)		SAMPLE AND CONTROL WATER UV TREATED AT 8 WATTS/20min/liter	

SPECIES:	Pimephales promelas	
ACCLIMATION WATER:	Mod. Hard Synthetic Freshwater	
FEEDING PRIOR TO TEST:	Artemia nauplii (<24 h old) ad libitum	
FEEDING DURING TEST:	Artemia nauplii (<24 h old, ~0.15 ml) 2x/day	
SOURCE:	CBI Stock cultures	
ACCLIMATION TEMP (°C):	25	
HATCH START DATE & TIME:	11/11/13 17:00	
HATCH END DATE & TIME:	11/12/13 9:20	
DATE/TIME WATER ADDED:	11/12/13 13:48	
DATE/TIME ANIMALS ADDED:	11/12/13 14:06	
ANIMAL AGE WINDOW:	16h 20m	
MAX AGE AT TEST START (TAC 24 h MAX):	24 h	
TEST SET UP BY:	AG	
TEST ID:	ESSL1320CPP	
PEER REVIEW BY (Initial/Date):	PB, BJA	11/20/13 16:26
ESSL1320CPP		

Fathead minnow-daily water quality bench sheet (EPA METHOD 1000.0) Template version CPP UV 070113

															SUMMARY WATER QUALITY DATA				
															MEAN	S.D.	MIN.	MAX.	
pH (°C)	UVC	7.89	7.67	7.88	7.61	7.78	7.68	7.86	7.55	7.68	7.40	7.76	7.52	7.75	7.31	7.67	0.18	7.31	7.89
	1	7.91	7.60	7.86	7.47	7.78	7.56	7.82	7.51	7.63	7.36	7.70	7.40	7.74	7.26	7.81	0.20	7.26	7.91
	2	7.88	7.60	7.75	7.43	7.74	7.51	7.70	7.48	7.53	7.26	7.61	7.31	7.69	7.23	7.65	0.19	7.23	7.88
	3	7.72	7.55	7.64	7.40	7.66	7.46	7.53	7.39	7.39	7.17	7.48	7.24	7.59	7.17	7.48	0.18	7.17	7.72
	4	7.52	7.51	7.47	7.33	7.50	7.40	7.26	7.26	7.11	7.10	7.21	7.11	7.34	7.04	7.30	0.17	7.04	7.52
	5	7.38	7.48	7.32	7.28	7.39	7.31	7.06	7.08	6.91	6.95	6.98	7.03	7.10	6.88	7.15	0.20	6.88	7.48
Temp (°C)	UVC	7.98	7.74	7.97	7.64	7.91	7.61	7.91	7.62	7.64	7.40	7.78	7.31	7.81	7.18	7.68	0.25	7.18	7.98
	1	25	24	24	25	24	24	25	25	25	25	25	25	25	25	25	0.5	24	25
	2	25	24	24	25	24	24	25	25	25	25	25	25	25	25	25	0.5	24	25
	3	25	24	24	25	25	24	25	25	25	25	25	25	25	25	25	0.5	24	25
	4	28	24	25	25	25	24	25	25	25	25	25	25	25	25	25	0.5	24	28
	5	28	24	25	25	25	24	25	25	25	25	25	25	25	25	25	0.5	24	28
Dissolved Oxygen (mg/L)	UVC	25	24	24	25	24	24	25	25	25	25	25	25	25	25	25	0.6	24	25
	1	8.1	8.0	8.0	7.3	8.0	7.8	7.9	7.0	7.4	6.9	7.7	7.4	8.0	7.2	7.6	0.4	6.9	8.1
	2	8.2	8.0	8.3	6.8	8.0	7.5	7.8	6.9	7.4	6.3	7.6	7.1	8.0	7.2	7.5	0.6	6.3	8.3
	3	8.2	8.0	8.2	6.9	7.9	7.3	7.0	6.8	7.5	6.3	7.6	6.7	7.9	7.1	7.4	0.6	6.3	8.2
	4	8.1	7.8	8.2	6.8	7.9	7.3	7.7	6.8	7.3	6.2	7.8	6.8	7.9	7.0	7.4	0.6	6.2	8.2
	5	7.9	7.8	8.1	6.8	7.8	7.3	7.6	6.7	7.3	6.3	7.5	6.9	7.9	6.9	7.4	0.6	6.3	8.1
Dissolved Oxygen (mg/L)	UVC	7.8	7.7	8.1	6.7	7.8	7.3	7.4	6.7	7.2	6.4	7.4	6.9	7.9	6.9	7.3	0.5	6.4	8.1
	1	8.2	7.9	8.3	7.3	8.1	7.5	8.0	7.4	7.4	7.0	7.8	6.4	7.8	6.6	7.6	0.8	6.4	8.3
	2	294		301		301		297		293		296		290		296	4.1	290	301
	3	339		339		337		335		332		332		328		335	4.1	328	339
	4	377		375		372		370		372		373		367		372	3.3	367	377
	5	450		442		442		441		438		438		438		441	4.3	438	450
Dissolved Oxygen (mg/L)	UVC	599		583		581		585		588		581		570		584	5.7	570	599
	1	730		717		711		710		725		716		710		717	8.0	710	730
	2	301		300		297		294		304		290		304		299	5.2	290	304
	3	A	C	D	B	C	C	A	D	B	A	C	A	D	B				
	4	AG	GB	BJA	AG	BJA	GB	RCD	RCD	KK	RCD	RCD	GB	GB	GB				
	5																		
Changes & Notes (Initials, date, specific change of notes)																			
Test Aerated? No																			
Date & Time Air Start																			
D.O. Highest conc. @ aeration																			
Total live highest conc. @ aeration																			
TRT ID: 1 2 3 4 5																			
CONC (%): 9.00% 18.0% 35.0% 59.0% 100%																			

Fathead minnow daily biological measurements bench sheet (EPA METHOD 1000.0) Template version CPP UV 070113

FATHEAD MINNOW DAILY BIOLOGICAL MEASUREMENTS BENCH SHEET (EPA METHOD 1000.0) TEMPLATE VERSION CPP UV 070113												
UVC	A	10	10	10	10	10	10	10	10	17.82	11.55	73
	B	10	10	10	10	10	9	9	9	18.00	11.28	74
UV	C	10	10	10	10	10	10	10	10	17.56	11.35	75
Control	D	10	10	10	10	10	10	10	10	18.44	11.20	76
		10	10	10	10	10	10	10	10	17.20	10.95	77
		10	10	10	10	10	10	10	10	18.60	11.43	78
		10	10	10	10	10	10	10	10	17.43	10.73	79
		10	10	10	10	10	10	10	10	15.87	8.84	80
		10	10	10	10	10	10	10	10	15.30	6.52	81
		10	10	10	10	10	10	10	10	14.36	6.11	82
		10	10	10	10	10	10	10	10	15.42	6.27	83
		10	10	10	10	10	10	10	10	14.64	6.29	84
		10	10	10	10	10	10	10	10	14.96	6.61	85
		10	10	10	10	10	10	10	10	15.40	9.32	86
		10	10	10	10	10	10	10	10	15.36	9.00	87
		10	10	10	10	10	10	10	9	16.97	9.67	88
		10	10	10	10	10	10	10	10	17.01	10.32	89
		10	10	10	10	10	10	10	10	17.26	11.02	90
		10	10	10	10	10	10	10	10	15.87	9.57	91
		10	10	10	10	10	10	10	10	17.60	10.77	92
		10	10	10	10	10	10	10	10	15.90	9.84	93
		10	10	10	10	10	10	10	10	17.82	11.15	94
		10	10	10	10	10	10	10	10	15.61	9.69	95
		10	10	10	10	10	10	10	10	17.17	10.33	96
		10	10	10	10	10	10	10	10	17.63	10.39	97
		10	10	10	10	10	10	10	9	16.82	10.91	98
		10	10	10	10	10	10	10	10	17.25	11.11	99
		10	10	10	10	10	10	10	10	15.54	10.40	100
DATE	11/13/13	11/13/13 14:13	11/14/13 13:51	11/15/13 14:38	11/16/13 14:38	11/17/13 13:54	11/18/13 13:44	11/19/13 14:15	11/20/13 15:11	11/15/13 12:31	Test Duration: 100.00	
CHANGES & NOTES (INITIALS, DATE, SPECIFIC CHANGE MADE)												
<div> <div>MEAN % UV CONTROL SURV. (TAC 80% MIN):</div> <div>AVG. DRY WT. PER SURV. UV CONTROL (TAC 0.25 mg):</div> </div>												
<div> <div>TIME COLLECT 1ST USE (TAC MAX 36h)</div> <div>TIME 1st TO LAST USE (TAC MAX 72 h)</div> </div>												
<div> <div>11/13/13 14:13</div> <div>11/14/13 13:51</div> </div>												
<div> <div>11/15/13 14:38</div> <div>11/16/13 14:38</div> </div>												

Larval Fish Growth and Survival Test-7 Day Survival

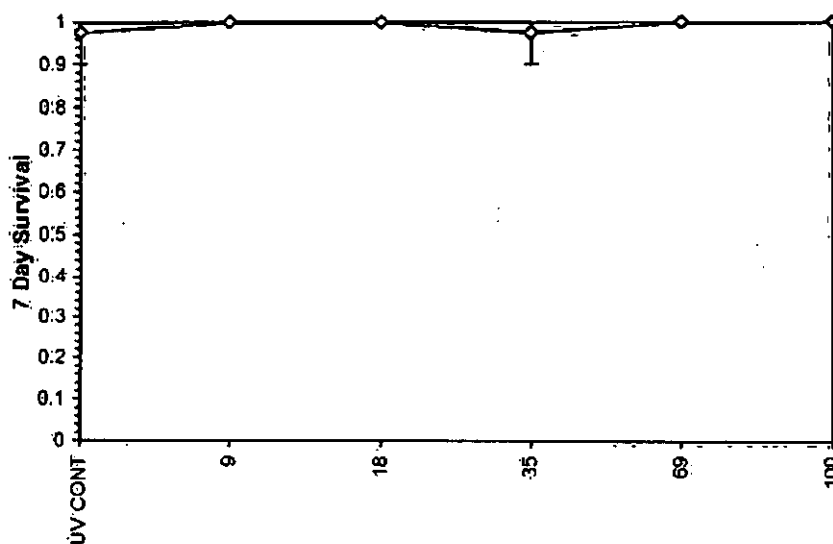
Start Date: Test ID: ESSL1320PP Sample ID:
 End Date: Lab ID: CBI Sample Type:
 Sample Date: Protocol: EPAF 94-EPA Freshwater Test Species: PP-Pimephales promelas
 Comments: DATA ENTERED BY PB

Conc-%	1	2	3	4
UV CONT	1.0000	0.9000	1.0000	1.0000
9	1.0000	1.0000	1.0000	1.0000
18	1.0000	1.0000	1.0000	1.0000
35	1.0000	1.0000	1.0000	0.9000
69	1.0000	1.0000	1.0000	1.0000
100	1.0000	1.0000	1.0000	1.0000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root				N	Rank Sum	1-Tailed Critical
			Mean	Min	Max	CV%			
UV CONT	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4		
9	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00
18	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00
35	0.9750	1.0000	1.3713	1.2490	1.4120	5.942	4	18.00	10.00
69	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00
100	1.0000	1.0256	1.4120	1.4120	1.4120	0.000	4	20.00	10.00

Auxiliary Tests		Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution ($p \leq 0.01$)		0.61382	0.884	-2.1359	5.27706
Equality of variance cannot be confirmed					
Hypothesis Test (1-tail, 0.05)		NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test		100	>100		1

Dose-Response Plot



Larval Fish Growth and Survival Test-7 Day Biomass

Start Date: Test ID: ESSL1320PP Sample ID:
End Date: Lab ID: CBI Sample Type:
Sample Date: Protocol: EPAF 94-EPA Freshwater Test Species: PP-Pimephales promelas
Comments: DATA ENTERED BY PB

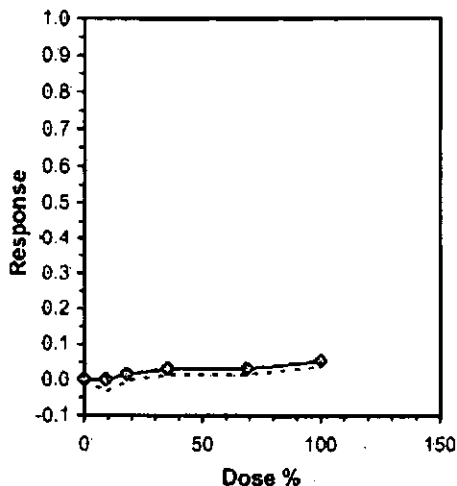
Conc-%	1	2	3	4
UV CONT	0.6270	0.6720	0.6210	0.7240
9	0.6250	0.7370	0.6700	0.7030
18	0.6780	0.6250	0.7150	0.6350
35	0.6350	0.6080	0.6360	0.7300
69	0.6690	0.6240	0.6300	0.6830
100	0.6060	0.6670	0.5920	0.6840

Conc-%	Mean	N-Mean	Transform: Untransformed					t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%	N				Mean	N-Mean
UV CONT	0.6610	1.0000	0.6610	0.6210	0.7240	7.227	4				0.6724	1.0000
9	0.6838	1.0344	0.6838	0.6250	0.7370	6.987	4	-0.719	2.410	0.0762	0.6724	1.0000
18	0.6633	1.0034	0.6633	0.6250	0.7150	6.251	4	-0.071	2.410	0.0762	0.6633	0.9864
35	0.6523	0.9868	0.6523	0.6080	0.7300	8.192	4	0.277	2.410	0.0762	0.6523	0.9701
69	0.6515	0.9856	0.6515	0.6240	0.6830	4.446	4	0.300	2.410	0.0762	0.6515	0.9690
100	0.6373	0.9641	0.6373	0.5920	0.6840	7.073	4	0.751	2.410	0.0762	0.6373	0.9478

Auxiliary Tests					Statistic		Critical		Skew		Kurt			
Shapiro-Wilk's Test indicates normal distribution (p > 0.01)					0.9333		0.884		0.42025		-1.067			
Bartlett's Test indicates equal variances (p = 0.96)					1.03306		15.0863							
Hypothesis Test (1-tail, 0.05)					NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Dunnett's Test					100	>100		1	0.07624	0.11534	0.00096	0.002	0.78526	5, 18

Linear Interpolation (200 Resamples)				
Point	%	SD	95% CL(Exp)	Skew

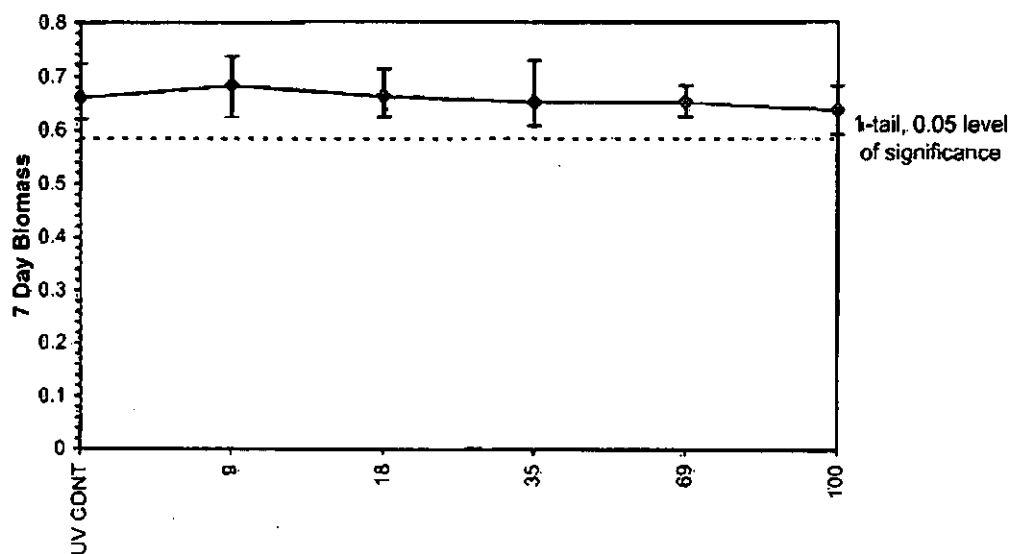
IC05	96.723			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Larval Fish Growth and Survival Test-7 Day Biomass

Start Date: Test ID: ESSL1320PP Sample ID:
 End Date: Lab ID: CBI Sample Type:
 Sample Date: Protocol: EPAF 94-EPA Freshwater Test Species: PP-Pimephales promelas
 Comments: DATA ENTERED BY PB

Dose-Response Plot



Larval Fish Growth and Survival Test-7 Day Biomass

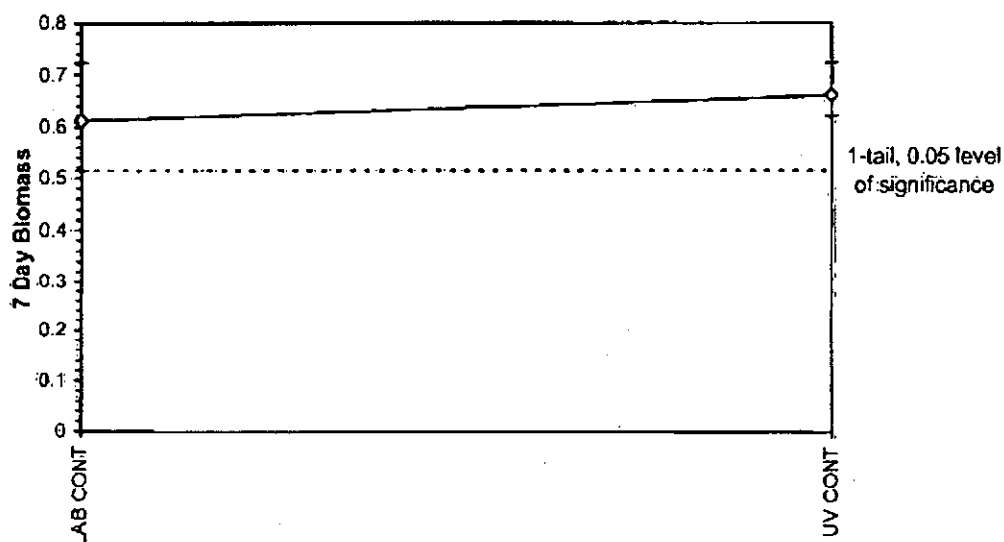
Start Date:	Test ID: IESSL1320C	Sample ID:	
End Date:	Lab ID: CBI	Sample Type:	CONTROLS
Sample Date:	Protocol: EPAF 94-EPA Freshwater	Test Species:	PP-Pimephales promelas
Comments:	DATA ENTERED BY PB		

Conc-%	1	2	3	4
LAB CONT	0.7240	0.5910	0.6140	0.5140
UV CONT	0.6270	0.6720	0.6210	0.7240

Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD
			Mean	Min	Max	CV%				
LAB CONT	0.6108	1.0000	0.6108	0.5140	0.7240	14.207	4	-1.015	1.943	0.0962
UV CONT	0.6610	1.0823	0.6610	0.6210	0.7240	7.227	4			

Auxiliary Tests	Statistic	Critical	Skew	Kurt		
Shapiro-Wilk's Test indicates normal distribution: (p > 0.01)	0.96826	0.749	0.48014	0.3736		
F-Test indicates equal variances (p = 0.35)	3.29926	47.4672				
Hypothesis Test: (1-tail, 0.05)	MSDu	MSDp	MSB	MSE	F-Prob	df
Homoscedastic t Test indicates no significant differences	0.09624	0.15757	0.00505	0.00491	0.34943	1, 6

Dose-Response Plot



Effluent and Dilution Water Log (Freshwater Tests) FWEFFL061013

SUMMARY WATER QUALITY DATA										
TEST	DATE	TIME	PARAMETER	UNIT	VALUE	UNIT	VALUE	UNIT	VALUE	
Initial	11/12/13	11:05	Temp (°C)	25	11/13/13	10:34	Temp (°C)	24	11/14/13	11:04
Sample	11/12/13	11:05	D.O. (mg/l)	9.0	11/13/13	10:34	D.O. (mg/l)	8.8	11/14/13	11:04
prop	11/12/13	11:05	Aeration Time (min)	2	11/13/13	10:34	Aeration Time (min)	1	11/14/13	11:04
measure-	11/12/13	11:05	Adjusted D.O. (mg/l)	8.2	11/13/13	10:34	Adjusted D.O. (mg/l)	8.2	11/14/13	11:04
ments	11/12/13	11:05	Final pH (S.U.)	7.43	11/13/13	10:34	Final pH (S.U.)	7.02	11/14/13	11:04
	11/12/13	11:05	Conductivity (µS/cm)(4)	718	11/13/13	10:34	Conductivity (µS/cm)(4)	705	11/14/13	11:04
	11/12/13	11:05	Final TRC (mg/l)(8)	N.D.	11/13/13	10:34	Final TRC (mg/l)(8)	N.D.	11/14/13	11:04
	11/12/13	11:05	Sample Filtered (80 µm)?	✓	11/13/13	10:34	Sample Filtered (80 µm)?	✓	11/14/13	11:04
	11/12/13	11:05	Date & Time:	11/12/13 11:56	11/13/13 11:03	11/14/13 9:34	11/15/13 11:45	11/16/13 10:02	11/17/13 9:43	11/18/13 9:32
	11/12/13	11:05	Initials:	BJA	AG	AG	BJA	RCD	RCD	GB
	11/12/13	11:05	Day 0	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
	11/12/13	11:05	2	3	3	1	1	1	2	
	11/12/13	11:05	24	25	25	25	25	25	25	
	11/12/13	11:05	304	303	297	296	295	291	291	
	11/12/13	11:05	8.3	8.2	8.2	8.2	8.2	8.2	8.2	
	11/12/13	11:05	8.03	7.93	7.91	7.90	8.08	7.91	7.94	
	11/12/13	11:05	88	94	94	82	82	82	98	
	11/12/13	11:05	58	57	57	60	60	60	61	
	11/12/13	11:05	11/12/13 8:50	11/13/13 8:25	11/14/13 8:35	11/15/13 8:25	11/16/13 8:55	11/17/13 9:00	11/18/13 9:00	
	11/12/13	11:05	GB	GB	AG	GB	RCD	RCD	GB	
Changes & Notes (Initials, date, specific change or notes)										
Peer review Initial/Date:	PB	11/20/13 14:55	Mod Hard Synthetic Freshwater (EPA)							
PROJECT ID:	ESSL1320	ADDITIONAL EFFLUENT TREATMENT								

ESSC1300-A 13-0925

ESS WO # 25785
ESS PO # 3206



BIOASSAY CHAIN OF CUSTODY

Customer CCA VPDES Permit # _____
Outfall/Location 001

SAMPLE INFORMATION

GRAB

Collection: Date 11/1/2013 Time 0840
Sample volume 4.500 ml. Flow rate _____
1 gallon.
Effluent: pH (SU) 7.11 Temp (°C) 13.7 Chlorine (mg/l) N/A
Dissolved O₂ (mg/l) 8.1 Conductivity (indicate unit) N/A
Analysis (Date/Time) 11/1/2013, 0840

COMPOSITE

Collection: From (Date/Time): _____ To (Date/Time): _____
of samples _____ Volume _____ Flow rate _____
Auto-sampler temperature (°C) _____
Effluent: pH (SU) _____ Temp (°C) _____ Chlorine (mg/l) _____
Dissolved O₂ (mg/l) _____
Analysis (Date/Time) _____

Sampler's Signature [Signature]

Received at ESS Lab by: Woodward Date 11-11-13 Time 0900
Delivery method to Bioassay Lab: UPS NOAUSaver Coolant used: ice

Received at Coastal Lab by: S. Bar Date 11/12/13 Time 1055
Temperature of sample upon receipt @ Coastal Lab: 14°C

<input checked="" type="checkbox"/>	Chronic	<i>Ceriodaphnia dubia</i>
<input checked="" type="checkbox"/>	Chronic	<i>Pimephales promelas</i>
<input type="checkbox"/>	Acute	<i>Ceriodaphnia dubia</i>
<input type="checkbox"/>	Acute	<i>Pimephales promelas</i>

ESSL/320-B 13-0931

ESS WO # 25785
ESS PO # 3206



BIOASSAY CHAIN OF CUSTODY

Customer CCA VPDES Permit # _____

Outfall/Location Outfall 001

SAMPLE INFORMATION

GRAB

Collection: Date 11/12/2013 Time 0745
Sample volume 9.600 ml. Flow rate _____
2.5 gal/hr

Effluent: pH (SU) 7.30 Temp (°C) 11.2 Chlorine (mg/l) _____
Dissolved O₂ (mg/l) 8.0 Conductivity (indicate unit) _____
Analysis (Date/Time) 11/12/2013 0745

COMPOSITE

Collection: From (Date/Time): _____ To (Date/Time): _____
of samples _____ Volume _____ Flow rate _____
Auto-sampler temperature (°C) _____

Effluent: pH (SU) _____ Temp (°C) _____ Chlorine (mg/l) _____
Dissolved O₂ (mg/l) _____
Analysis (Date/Time) _____

Sampler's Signature [Signature]

Received at ESS Lab by: C Woodward Date 11-12-13 Time 0810
Delivery method to Bioassay Lab: NDA in Saveri Coolant used: Ice

Received at Coastal Lab by: [Signature] Date 11/13/13 Time 1015
Temperature of sample upon receipt @ Coastal Lab: 10°C

<u>X</u>	Chronic	<i>Ceriodaphnia dubia</i>
<u>P</u>	Chronic	<i>Pimephales promelas</i>
_____	Acute	<i>Ceriodaphnia dubia</i>
_____	Acute	<i>Pimephales promelas</i>

ESS 21320-1 13-0439

ESS WO # 25785
ESS PO # 3206



BIOASSAY CHAIN OF CUSTODY

Customer CCA VPDES Permit # _____
Outfall/Location 001

SAMPLE INFORMATION

GRAB

Collection: Date 11-14-2013 Time 0900
Sample volume 19.200 L. Flow rate _____
Squams.
Effluent: pH (SU) 6.52 Temp (°C) 8.2°C Chlorine (mg/l) Nil
Dissolved O₂ (mg/l) 7.7 Conductivity (indicate unit) NA
Analysis (Date/Time) 11-14-2013 / 0900

COMPOSITE

Collection: From (Date/Time): _____ To (Date/Time): _____
of samples _____ Volume _____ Flow rate _____
Auto-sampler temperature (°C) _____
Effluent: pH (SU) _____ Temp (°C) _____ Chlorine (mg/l) _____
Dissolved O₂ (mg/l) _____
Analysis (Date/Time) _____

Sampler's Signature A. Woodward

Received at ESS Lab by: A. Woodward Date 11-14-13 Time 1015
Delivery method to Bioassay Lab: UPS NDA Sealed Coolant used: Ice

Received at Coastal Lab by: J. A. Date 11/25/13 Time 1050
Temperature of sample upon receipt @ Coastal Lab: 20°C

<u>X</u>	Chronic	<i>Ceriodaphnia dubia</i>
<u>X</u>	Chronic	<i>Pimephales promelas</i>
_____	Acute	<i>Ceriodaphnia dubia</i>
_____	Acute	<i>Pimephales promelas</i>

Public Notice – Environmental Permit

PURPOSE OF NOTICE: To seek public comment on a draft permit from the Department of Environmental Quality that will allow the release of treated wastewater into a water body in Culpeper County, Virginia.

PUBLIC COMMENT PERIOD: February 25, 2014 to March 27, 2014

PERMIT NAME: Virginia Pollutant Discharge Elimination System Permit – Wastewater issued by DEQ, under the authority of the State Water Control Board

APPLICANT NAME, ADDRESS AND PERMIT NUMBER: Boston Water & Sewer, 2301 Wyoming Ave NW, Washington DC, 20008 VA0065358

NAME AND ADDRESS OF FACILITY: Boston Water & Sewer STP, 1 mile SSW of intersection of Routes 522 and 707, Boston, VA

PROJECT DESCRIPTION: Boston Water & Sewer has applied for a reissuance of a permit for the private Boston Water & Sewer STP. The applicant proposes to release treated sewage wastewaters from a private business and conference center at a rate of 0.015 million gallons per day into a water body. The sludge will be disposed by pump and haul to an approved facility (Remington WWTP VA0076805). The facility proposes to release the treated sewage in the Hazel River, unnamed tributary, in Culpeper County in the Rappahannock watershed. A watershed is the land area drained by a river and its incoming streams. The permit will limit the following pollutants to amounts that protect water quality: pH, BOD, Total Suspended Solids, Ammonia as N, Total Recoverable Copper, Total Recoverable Zinc, *E. coli*, Dissolved Oxygen, and Whole Effluent Toxicity.

HOW TO COMMENT AND/OR REQUEST A PUBLIC HEARING: DEQ accepts comments and requests for public hearing by hand-delivery, e-mail, fax or postal mail. All comments and requests must be in writing and be received by DEQ during the comment period. Submittals must include the names, mailing addresses and telephone numbers of the commenter/requester and of all persons represented by the commenter/requester. A request for public hearing must also include: 1) The reason why a public hearing is requested. 2) A brief, informal statement regarding the nature and extent of the interest of the requester or of those represented by the requester, including how and to what extent such interest would be directly and adversely affected by the permit. 3) Specific references, where possible, to terms and conditions of the permit with suggested revisions. A public hearing may be held, including another comment period, if public response is significant, based on individual requests for a public hearing, and there are substantial, disputed issues relevant to the permit.

CONTACT FOR PUBLIC COMMENTS, DOCUMENT REQUESTS AND ADDITIONAL INFORMATION: The public may review the draft permit and application at the DEQ-Northern Regional Office by appointment, or may request electronic copies of the draft permit and fact sheet.

Name: Alison Thompson

Address: DEQ-Northern Regional Office, 13901 Crown Court, Woodbridge, VA 22193

Phone: (703) 583-3834 E-mail: Alison.Thompson@deq.virginia.gov Fax: (703) 583-3821

pH values
Feb-03

8.03
8.5
8.48
7.55
8.26
8.58
7.31
7.04
7.68
8.24
8.3
8.36
7.45
7.27
8.38
8.41
8.57
8.31
8.32
8.49
8.55
7.36
7.03
7.23
6.86
7.14
7.24
7.02
7.61
7.73
7.75
7.62
7.07
7.93
7.59
6.77
8.43
7.63
7.34
7.88
8.03
8.69
8.42
8.36
8.24
8.74
8.07
7.94
8.29
7.99
8.56

Temp values
Feb-03

4.7
4.3
4.8
5.2
4.4
5
4.4
4.2
5.2
4.4
4
4.8
3.8
3.1
3.8
2.7
5.4
4.6
4.5
4.9
4.8
4.6
4.1
9
7.6
8.3
7.5
6.4
5.9
7.2
8.2
7.1
6.1
5.2
5.1
5.5
5.4
2.9
5.6
4.2
3.5
1.8
3.4
5.4
3
3.2
3.9
0.9
3
2.9
4.6

Jan-03

Jan-03

Jan-02	7.86		5.8
	6.77	Jan-02	2.5
	7.7		2.2
	7.3		3
	6.79		6.1
	8.35		6
	7.23		5.9
	7.34		6.7
	7.21		6.8
	7.19		9.1
	7.2		6.1
	7.26		6.4
	7.31		8.9
	7.43		6.8
	7.11		6.9
	7.45		6.9
	7.4		5.5
	7.32		6.1
	7.14		6
	7.26		8
	7.22		6.9
	7.55		7.8
	7.31		8.1
	7.39		7.9
	7.61		8.5
	8.04		8.5
	7.72		9.7
	8.4		12.4
Feb-02	7.92		11.2
	8.27	Feb-02	11.8
	7.89		9.9
	7.93		9
	7.91		7.7
	7.74		7.3
	7.38		6.6
	7.26		8.4
	7.39		7.6
	8.13		7.5
	7.49		7.6
	7.26		6.7
	7.32		6.7
	7.95		7.6
	7.38		6.3
	7.19		7.7
	7.41		7.9
	7.69		7.4
	7.54		7.4
	7.16		8.3
	7.12		9
	7.04		9
	7.33		7.9
	7.28		7.7

	7.34		9.6
	7.4		8.3
Mar-02	7.89		7
	7.85	Mar-02	6.9
	7.76		6.7
	7.81		7.5
	7.9		7.1
	7.84		5.5
	7.78		7.9
	7.59		7.5
	7.25		8.6
	7.77		9.3
	8.08		10.1
	8.23		8
	8.44		8.5
	8.34		9.2
	8.41		10
	8.16		11
	7.73		12.7
	7.69		11.5
	8.02		11.3
	8.43		10.7
	8.01		10.7
	7.86		10.1
	7.99		10.1
	8.32		9.6
	8.68		9.3
	7.95		9.9
	8.21		9.6
	8.22		9.8
	8.42		10.8
Apr-02	8.33		10.7
	8.11	Apr-02	11.5
	7.83		10.3
	7.69		12
	7.42		11.7
	7.57		10.1
	7.26		10.5
	7.94		9.9
	7.62		10.4
	7.44		11.3
	7.33		12.7
	7.71		13
	7.61		14.1
	7.43		15.5
	7.91		15.1
	7.44		15.4
	7.41		17.6
	7.5		18.5
	7.64		18
	7.5		18.3
	8		18.1

	8.12		16.4
	8.2		15.3
	7.89		14
	7.55		15.2
	7.47		14.4
	7.56		14.3
	7.31		14.8
	7.89		15.6
May-02	8.11		16
	8.06	May-02	15.1
	8.23		15.9
	7.66		15.6
	8.06		15.4
	8.16		15.5
	8.45		16.1
	8.32		16.3
	8.16		17.4
	8.32		17.5
	7.3		17.8
	8.23		17.8
	7.83		18.4
	7.89		17.9
	7.56		16.9
	7.52		17.7
	7.55		17.9
	7.71		18
	7.39		15.4
	7.73		14.8
	7.74		14.6
	7.74		15.4
	7.58		14.4
	7.46		16.3
	7.59		17
	7.48		16.9
	7.85		19.1
	8.02		19.1
Jun-02	7.72		20
	7.41	Jun-02	21.3
	7.79		21.5
	7.63		20.8
	7.39		21.2
	7.42		21.3
	8.16		21.9
	7.3		21.3
	7.74		20.2
	7.81		20.9
	7.61		21.7
	7.79		21.3
	7.76		21.5
	7.58		20.6
	7.62		21.9
	7.53		21.8

	8.11		19
	7.82		20.1
	7.79		19.8
	7.48		18.6
	7.55		20.6
	7.61		20.9
	7.68		18.2
	8.26		20.8
	7.92		21.4
	7.72		22
	7.55		23
	7.59		22.9
Jul-02	7.26		23.3
	7.36		23
	7.52	Jul-02	23.4
	7.71		23.7
	7.52		24.2
	8.08		24.8
	8.23		22.9
	8.06		21
	7.14		23.3
	7.95		23.1
	7.21		23.6
	8.16		22.8
	8.02		22.7
	7.62		21.8
	7.67		21.6
	7.3		21.2
	7.73		22.2
	8.57		22.9
	7.87		23.6
	7.98		23.9
	8.57		24.1
	8.11		24.9
	8.04		23.9
	8.53		24.7
	8.62		24.4
	8.44		24.1
	7.99		23.4
	8.42		23.1
	8.23		23.6
	7.54		24.3
Aug-02	7.06		24.7
	8.19		25.2
	7.7	Aug-02	24.9
	8.09		24.6
	8.06		25.9
	8.05		25.6
	8.14		25.1
	7.82		24.5
	8.36		23.6
	7.93		22.8

	8.11		22.3
	8.24		22.2
	8.42		22.2
	8.09		22.8
	7.95		23.1
	7.72		24.6
	8.02		25.1
	8.16		24.5
	8.22		24.6
	7.6		24.8
	7.7		25.4
	8.19		24.7
	7.55		24.5
	7.6		24.7
	8.09		24.3
	7.71		25
	8.01		23.8
	7.76		23.7
	7.94		23.2
	7.78		22.1
	7.88		22.1
Sep-02	7.87		22.2
	7.43	Sep-02	20.5
	7.77		24.5
	7.73		22.4
	8.25		22.6
	8.28		22.1
	8.18		21.3
	7.89		22.1
	8.12		21.2
	7.78		20.8
	7.57		20.2
	7.67		20.6
	8.24		20.2
	7.69		21.6
	8.02		21.7
	7.27		21.3
	7.38		21.9
	8.13		22.3
	7.72		22.5
	8.31		22.4
	7.76		21.1
	7.7		20.2
	8.55		19.9
	7.85		19.4
	7.96		19.9
Oct-02	8.16		19.8
	8.23	Oct-02	19.7
	7.89		19.9
	8.08		19.4
	7.92		21.1
	8.07		21.1

	7.65		19.3
	7.4		20.4
	7.27		19.2
	7.33		18.4
	7.69		18.4
	7.89		17.7
	8.25		18.6
	8		18.9
	7.78		17.9
	7.28		15.2
	7.97		16.2
	7.72		16.2
	8.19		15.5
	7.9		15.5
	8.28		14.8
	7.96		14.2
	8.33		14.5
	7.83		14.7
	8.04		14.1
	7.84		14.2
	7.86		14.3
	8.18		13.9
	7.64		13.1
Nov-02	7.86		12
	8.61	Nov-02	12.3
	8.16		11.2
	8.3		10.9
	7.28		10.6
	8.57		11
	8.13		11.2
	7.23		10.2
	8.33		10.9
	7.65		14.6
	7.39		14.9
	7.14		14.4
	7.06		18.4
	7.13		11.3
	7.06		10.9
	8.22		11.9
	7.97		10.9
	7.53		11
	7.81		10.5
	7.66		11.4
	7.53		9.1
	7.78		9.3
	7.43		3.8
	7.71		9.6
	7.59		8.6
	8.25		8
	7.91		7.6
Dec-02	7.69		8.4
	7.03	Dec-02	7.4

	8		7.4
	8.01		5.4
	8.28		5.4
	8.02		5.7
	8.3		4.6
	7.96		5.1
	7.55		4.9
	7.7		8.6
	7.74		6.4
	8.13		6.7
	6.51		6.5
	7.33		6.6
	7.15		9
	7.24		9
	7.2		7.7
	7.13		7.4
	7.52		7
	7.27		9.2
	6.97		7.5
	7.5		6.4
Jan-01	7.69		7.6
	7.94		5
	7.62	Jan-01	1.9
	7.76		1.9
	7.98		1.8
	8.2		1.8
	7.75		2.4
	7.38		1.1
	7.37		2.5
	6.63		2.6
	7.57		4
	8.1		4
	7.63		5.9
	7.62		2.5
	7.48		4.6
	7.56		5.3
	7.43		5.1
	7.51		4.7
	7.57		4.1
	6.92		5.6
	7.51		5.1
	7.64		3.9
	7.71		4.2
	7.51		3.9
	6.83		3.6
	7.58		3.9
	7.81		3.8
	7.02		3.9
Feb-01	7.47		5.9
	7.59		6.2
	7.41	Feb-01	5.3
	6.99		4.6

	7.65		5.2
	7.84		4.6
	7.91		5
	7.96		5.1
	7.67		5.3
	7.59		5.5
	7.44		6.7
	7.74		7.9
	7.81		6.5
	7.87		4.2
	7.84		5.4
	7.55		6.9
	7.38		8.3
	6.96		5.2
	7.79		7.8
	7.07		7.2
	7.71		7
	7.34		7.6
	7.81		5.3
	7.54		5.4
	8.3		5.7
	7.82		6.9
Mar-01	7.52		5.6
	8.17	Mar-01	6.1
	7.62		6.3
	7.67		6.5
	7.58		6.6
	7.84		6.5
	7.64		5.6
	7.82		5.9
	8.24		6.1
	8.2		6.1
	7.23		6.3
	7.36		7
	7.39		7.3
	8.28		7
	7.65		7.6
	7.73		8.2
	7.61		7.9
	7.92		7.7
	7.68		7.3
	7.51		6.8
	7.62		7.9
	7.69		7.3
	7.23		8.1
	7.25		8.3
	7.32		7.9
	7.67		7.2
	7.53		5.7
	7.72		6.3
	6.91		6.8
Apr-01	7.55		7.9

	7.26	Apr-01	8.1
	7.46		8.6
	7.5		8.4
	7.47		9.2
	7.33		9
	7.06		9.6
	7.68		11.5
	7.66		12
	7.61		12.3
	8.06		13
	7.44		14.7
	7.09		15.1
	7.7		15.1
	7.62		15.2
	7.71		14.1
	7.24		13.5
	7.26		12.4
	7.44		12.2
	7.62		11.7
	7.58		11.8
	7.61		14.9
	7.66		14.9
	7.21		14.2
May-01	7.96		13.9
	7.64		14.9
	7.56	May-01	14.3
	7.21		15.3
	7.74		15.5
	7.45		16
	7.4		17.3
	7.13		16.6
	7.61		15.6
	7.53		15.7
	7.71		16.3
	7.64		17.3
	7.46		16.7
	7.53		16.2
	7.32		16.4
	6.8		12.8
	7.57		15
	7.62		15.2
	7.31		16.3
	7.71		16.1
	7.04		16.7
	7.26		16.4
	7.13		16.7
	7.34		16.7
	7.68		16.9
	7.49		17.6
	7.38		17.3
	7.45		17.5
Jun-01	7.46		18.1

	7.32	Jun-01	17.5
	7.26		18
	7.32		17.3
	7.53		17.7
	7.53		19.8
	7.58		19.2
	7.37		19.3
	7.42		20
	7.5		22.1
	7.51		20.2
	7.49		20.2
	7.22		21.1
	7.31		21.6
	7.6		22
	7.46		21.4
	7.4		21.6
	7.41		22.2
	6.47		22.1
	7.42		21.7
	7.48		21.5
	7.51		21.2
	7.42		22.6
	7.53		22
	6.54		22.5
Jul-01	7.61		23.7
	7.43	Jul-01	20.3
	7.36		21.2
	7.13		18.4
	7.7		23
	7.01		21.5
	7.26		21.7
	7.36		23.1
	7.41		21.8
	7.53		24.4
	7.48		22
	8.12		21.4
	7.53		21.6
	7.57		21.8
	7.46		22.6
	7.56		21.6
	7.59		21.9
	7.19		21.4
	7.12		20.8
	7.48		22
	7.42		21.8
	7.32		25.6
	7.38		22.4
	7.6		20.2
	7.4		21.2
	7.62		21.1
Aug-01	7.25		21.4
	7.14	Aug-01	22

	7.21		21.3
	7.5		21.6
	7.46		23.5
	7.36		23.9
	7.42		23.7
	7.39		23
	7.48		23.4
	7.87		24.9
	7.64		24.2
	7.43		23.8
	7.58		23.9
	7.53		22.4
	7.42		22.6
	7.35		21.3
	7.41		23.5
	7.48		22.8
	7.54		22.9
	7.73		22.8
	7.66		22.6
	7.41		23.2
	7.58		22.7
	7.36		21.6
	7.41		22.5
	7.46		22.1
	7.48		22.7
Sep-01	7.51		23
	7.43	Sep-01	22.1
	7.58		22.6
	7.62		21
	7.57		22.4
	7.29		21.3
	7.36		20.6
	7.21		21
	7.29		20.2
	7.38		19.4
	7.28		24.9
	7.41		18.9
	7.41		18
	7.36		19.7
	7.41		19.7
	7.37		19.5
	7.48		19.8
	7.32		20.6
	7.51		20.2
	7.38		20.7
	7.33		18.3
	7.41		17.2
	7.16		16.8
	7.39		16.3
Oct-01	7.26		16.3
	7.17	Oct-01	15.7
	7.24		20.3

	7.36		21.6
	7.34		21.8
	7.12		21.7
	7.11		16.2
	7.23		12
	7.26		13.4
	7.35		16.3
	7.46		19.9
	7.31		20.2
	7.31		18.7
	7.26		18.7
	7.48		17.9
	7.33		12.6
	7.16		16.8
	7.27		17.8
	7.39		16.3
	7.24		16
	7.19		21.6
	7.34		20.1
	7.28		13.3
	7.21		14.5
	7.61		16.7
Nov-01	7.5		13.5
	7.43	Nov-01	17
	7.01		20.1
	7.11		14.1
	7.26		16.8
	7.49		14.6
	7.32		14.1
	7.39		15.1
	7.09		16.8
	7.18		12.7
	7.24		12.4
	7.31		11.6
	7.28		15.6
	7.5		15.9
	6.68		10.3
	7.38		12.3
	7.33		16.4
	7.39		16
	7.27		15.5
	7.24		14.3
	7.43		15.3
	7.5		17.2
	7.35		16.6
	7.29		17.5
	7.33		16.2
Dec-01	7.3		16.4
	7.19	Dec-01	17.1
	7.25		13.6
	7.19		11.6
	7.24		12.3

	7.52		15.1
	7.43		13.5
	7.39		12.4
	7.58		9.6
	7.32		10.8
	7.27		12
	7.32		13.2
	7.21		12.8
	7.34		12.9
	7.28		13.3
	7.17		13.6
	7.31		14
	7.52		13.4
	7.66		8.7
	7.79		7.8
	7.36		7
	7.6		12.3
	7.94		6.9
Jan-00	7.84		8.1
	8.25		4.8
	8.3	Jan-00	6.4
	8.48		7.5
	8.29		8.5
	8.14		9.9
	8.01		8.4
	8.13		6.5
	7.25		7.7
	8.44		6.7
	7.79		6.9
	8.02		7.4
	8.34		6.5
	8.59		6.3
	8.46		5.5
	8.25		4.7
	7.5		7
	7.05		4.4
	8.25		3
	8.44		3.9
	8.17		3.7
	8.26		2
	8.79		1.54
	8.58		2.4
	8.73		1.8
	8.67		1.3
	7.9		1.4
	7.96		1.8
Feb-00	7.53		2
	8.34		3
	8.52	Feb-00	1
	7.18		2
	7.84		2.1
	7.84		2

	7.86		3.1
	7.87		3.6
	7.88		3.5
	8.22		3.6
	8.08		2.9
	8.43		4.8
	8.12		5.2
	8.25		4.1
	8.17		4.2
	8.25		4.9
	8.31		5.6
	8.39		5.2
	8.41		5.7
	8.61		8.5
	8.63		8.8
Mar-00	8.49		6.4
	8.28	Mar-00	8.3
	8.23		9.4
	8.17		8.8
	8.22		8.2
	8.1		9.1
	8.32		9.4
	8.29		10.3
	8.11		10.2
	8.23		13.1
	8.26		10.6
	7.14		10.8
	7.8		11
	7.23		10.6
	7.17		10.3
	7.77		11
	8.48		9.2
	8.54		8.8
	7.58		8.5
	7.82		8.4
	7.63		8.9
	8.16		10
	8.08		12.4
	8.03		10.6
	7.71		10.8
	7.35		10.1
	7.28		11.4
	8.23		9.3
Apr-00	7.67		10.7
	7.95	Apr-00	10.2
	8		11
	8.04		11.7
	7.67		13.3
	7.57		11.5
	8.26		11
	7.89		12.6
	8.23		13.9

	7.72		11.3
	7.34		11.2
	7.75		10.9
	7.9		12.2
	7.98		13.2
	7.81		13.2
	7.58		13.9
	7.8		14.3
	7.48		13.6
	7.41		12.7
	7.4		13.4
	7.68		12.8
	7.27		12.5
	7.38		13
	7.36		13.4
May-00	7.45		13.4
	6.92	May-00	12.4
	7.81		14.6
	8.01		14.4
	7.34		13.7
	7.51		16
	7.94		17.1
	7.52		17.5
	7.94		18.5
	7.5		19.5
	7.53		19.1
	7.73		20.1
	8.03		20
	8.21		17.3
	7.84		15.8
	7.74		17.7
	7.73		18.7
	7.84		19.2
	7.69		17.1
	8.25		18.3
	7.7		18.1
	7.89		20
	8.14		19.3
	7.84		17.1
	7.86		18.8
	8		18.2
	7.81		15.9
Jun-00	7.93		17.7
	7.88	Jun-00	16.9
	7.43		17.8
	7.73		19.7
	7.92		18.8
	8		18.1
	7.94		17.6
	6.9		17.4
	8.27		20.1
	7.63		20

	8.48		19.9
	7.83		21.5
	7.62		21.4
	7.63		21.5
	7.86		22.5
	7.85		22.8
	7.63		22.9
	8.03		22.3
	8.01		20.3
	7.48		21.3
	7.64		22.6
	8.61		21
	7.68		22.2
	7.87		22
	7.41		22.9
	8.1		23.3
Jul-00	7.72		23.3
	7.69		21.3
	8.42	Jul-00	22.6
	8.57		22.2
	8.44		23.4
	8.46		23.5
	8.43		23
	8.29		22.9
	8.06		19.4
	8.27		21.9
	7.83		22.3
	8.24		22.6
	8.24		22.7
	8.17		22.2
	8.21		21.3
	8.21		22.4
	7.86		22.5
	7.95		23.7
	7.95		22.5
	7.91		21.8
	7.5		20.3
	7.3		22
	7.91		20
	7.91		20.8
	7.72		21
	7.48		20.9
	7.64		21.4
	7.52		22.4
	7.9		22.4
Aug-00	6.97		22.2
	7.18		23.2
	7.17	Aug-00	23
	7.33		23.4
	7.41		24
	7.47		23.4
	7.84		23.9

	7.36		22.2
	7.54		23.2
	7.37		24.3
	7.78		23.8
	7.71		23.9
	7.4		23.8
	7.69		24.2
	7.55		22.4
	7.76		22.8
	7.84		23.2
	7.64		22.4
	7.73		22.2
	8.02		21.4
	7.54		21.2
	7.87		21.6
	7.62		21.4
	7.74		21.9
	8.36		22
	7.77		21.9
	7.64		21.4
	7.63		21.2
Sep-00	7.42		23
	7.54		22.9
	7.72	Sep-00	24.1
	8.27		25.3
	7.69		22.5
	8.2		22.7
	8.25		21.2
	8.05		20.8
	7.98		20.4
	8.53		23.7
	8.04		20.6
	8.06		21.3
	8.27		22.8
	7.94		22.2
	8.02		22.5
	8.1		22
	8.11		22.6
	7.83		20.1
	8.04		19.2
	7.99		18
	7.95		18
	7.73		19.2
	9.78		19.4
	7.9		18.8
	7.97		17.4
	8.29		17.1
	7.7		16.6
Oct-00	7.72		16.1
	7.9		19.8
	7.46	Oct-00	16
	7.65		15.8

7.81	17.5
7.62	17.8
7.51	18.1
7.62	18.5
7.7	19.8
8.02	14.2
8.21	13.8
8.11	14
7.64	13.2
7.49	14.1
7.61	13.6
7.55	10.9
7.63	11.4
7.56	16.2
7.77	15.5
7.44	15.7
7.77	15.4
7.87	15.3
7.91	17.2
7.83	15.8
7.77	14.4
7.59	14.9
7.81	15
7.73	15.1
7.62	15
7.7	17.1
7.84	15.3
Nov-00 8.11	14
7.89	13.5
7.94	Nov-00 14
7.84	12.7
7.92	12.5
8.01	14.1
7.72	13.5
8.01	12.3
7.59	11.4
7.76	11.6
7.74	12.7
7.22	13.8
7.79	12.6
7.96	11.5
7.86	11.6
7.73	11
8.01	10.1
8.2	10
8.29	11.4
8.14	10.1
7.92	8.4
7.91	7.9
7.89	6.8
6.98	6.1
7.1	5.7

	7.22		6.5
	7.94		9.5
	7.78		11.3
	7.9		7.2
Dec-00	7.67		7.4
	7.78		7.2
	7.88	Dec-00	6.8
	8		6.9
	7.74		7.2
	8.01		5
	7.88		4.6
	7.89		4.7
	7.92		6.3
	7.71		6.4
	7.02		4.6
	7.64		4.6
	7.43		5.1
	7.61		4.1
	7.58		4.7
	7.71		4.5
	7.52		9.7
	7.57		8.9
	7.68		4.8
	7.83		4.7
	8.16		4.3
	8.23		3.9
	8.31		3
	8.25		3.9
	8.17		3.5
	7.66		3.2
	7.93		3.9
	7.82		2.9
	7.71		2
	7.56		2.3
			0.9
90th per	8.26	90th per	22.8